Proposed Actions to Address the Competitiveness of Canada’s Upstream Oil and Natural Gas Sector

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# CONTENTS

### Executive Summary

Section 1: INTRODUCTION

- The Challenge and the Opportunity ......................................................... 12
- The Joint Working Group Process .......................................................... 13
- The Industry Submission to Governments ............................................... 14

Section 2: JOINT OVERVIEW OF BUSINESS INVESTMENT
CLIMATE AND INCLUSIVENESS ASSESSMENT

- Business Investment Climate ...................................................................... 16
- Inclusiveness Assessment ........................................................................... 24

Section 3: LIQUIDS RICH NATURAL GAS

- Context ........................................................................................................ 28
- Market Access ............................................................................................. 29
- Technology and Innovation ......................................................................... 33
- Summary of Modelling Results ................................................................. 36
- Branding ...................................................................................................... 40
- Conclusions ................................................................................................. 41
JOINT WORKING GROUP - AN INTRODUCTION

A Joint Working Group (JWG) was convened in late 2017 as a forum for industry, federal and provincial governments to examine issues affecting the competitiveness of the upstream oil and natural gas industry in Canada. This industry submission to governments builds on and extends the work of the JWG. In developing this report and recommendations, industry took into consideration input and feedback provided by government representatives during the JWG process. However, the report is the responsibility of industry alone. The government representatives on the JWG have not committed to take action to address the “competitiveness gap,” nor did they endorse the potential actions outlined in the opportunity areas. For further clarity, participation by government representatives in the JWG process has been without prejudice to any future decisions that may be taken by governments and to any further analysis and modeling governments may decide to conduct regarding the competitiveness of the Canadian upstream oil and natural gas sector.
Context

As one of Canada’s largest industries, the oil and natural gas sector plays a key role in the Canadian economy while also providing environmentally and socially responsible energy to global markets. Given growing global demand for oil and natural gas, the Canadian industry has the potential to continue to do so for several decades. In order to realize this opportunity, the oil and natural gas industry is of the view that there is a near term imperative for actions by industry and governments to address significant and systemic competitiveness gaps relative to competing jurisdictions, particularly the United States. This report assesses this competitiveness gap and identifies several opportunity areas for potential action. Industry strongly believes that focused and coordinated action is required in the very near term, in order to restore investor confidence and renew growth in the sector for the benefit of all Canadians while supporting the transition to a lower-carbon economy. This urgency arises from a confluence of several factors, most notably the increasing momentum toward migration of investment capital to other jurisdictions and the challenges in attracting new capital to Canada, the timing of the next window of opportunity to participate in global natural gas markets, and the increasing imperative to diversify markets for crude oil beyond the U.S. Once established, this negative momentum is difficult and time-consuming to reverse. Canada has large and high-quality crude oil and natural gas resources, but the value of these resources (responsible development, jobs, economic benefits) can only be realized if industry invests the capital necessary to monetize these resources. The oil and natural gas industry in Canada is at a critical juncture in terms of near term decisions on several large investment projects.

Canada and the world are currently facing a significant challenge in meeting growing demand for safe, reliable and affordable energy, while also responding to the impacts of climate change and the need to move toward a lower-carbon energy system/ economy over the next several decades.

These two imperatives are not incompatible if addressed in a balanced and responsible manner over time. In fact, for Canada they should go hand-in-hand.

The recent International Energy Agency’s World Energy Outlook (New Policies Scenario) projects that global energy demand by 2040 will have increased by about 30 per cent from today’s level. This demand growth is driven by population increases and by greater urbanization and industrialization, largely in Asia. The IEA also projects that by 2040 oil and natural gas will continue to supply more than half of the global energy demand. As such, the timing is opportune for Canadian supply to capture new markets. These opportunities apply to both crude oil, with the gap between projected oil demand and the existing/planned supply additions being in the range of 30 million barrels per day out to 2035, and for natural gas, with the next cycle of LNG demand emerging over the 2022-2030 period. As the fifth-largest producer of natural gas and sixth-largest producer oil in the world, Canada should be responsive to this market opportunity and continue to play a very important role in meeting global energy demand and reducing global energy poverty. Canada can do so in a manner that...
contributes to reducing global carbon emissions and positions Canada among the global leaders in environmental and social performance standards. If Canadian supply does not meet this demand, then supply will be provided by other jurisdictions that are likely to have lower environmental and social standards.

In the Canadian context, the industry took inspiration in part from the recent Advisory Council on Economic Growth reports, Path to Prosperity: Resetting Canada’s Growth Trajectory and Unleashing Productivity Through Infrastructure. These reports highlight the opportunity to unleash growth potential in key sectors such as energy and renewables, to position Canada as a preferred global trading partner, and to enable productivity through infrastructure development. Canada’s energy industry is among the largest economic engines driving our economy, both directly and through its linkages to other industries such as petrochemicals, power generation and the manufacturing sector. For Canadians, our oil and natural gas resources can continue to provide secure, reliable and affordable energy supply, while sustaining employment and economic prosperity throughout the value chain. Furthermore, oil and natural gas development presents a tremendous opportunity for inclusive economic growth and further tangible progress in reconciliation with Canada’s Indigenous peoples.

At the same time as this economic opportunity presents itself, there is also an international consensus on the need to address global climate change and to reduce carbon emissions from the global energy system. Canada has committed to work toward significant reductions in greenhouse gas (GHG) emissions, through its commitment to the 2015 Paris Climate Agreement and through the Pan-Canadian Framework on Clean Growth and Climate Change. The Canadian oil and natural gas industry recognizes the need to address global climate change and is broadly supportive of the climate policy goals and policy frameworks being implemented by Canadian governments, provided that such policies are implemented in a manner so as to provide incentive for industry to reduce GHG emissions, while addressing the competitiveness impacts for sectors that are competing in the open market with companies operating in jurisdictions with less stringent climate policy. It is noteworthy that Canada is the only one of the ten largest oil-exporting countries in the world that has implemented a carbon pricing policy.¹

Canadian oil and natural gas producers are collaborating on technology and innovation to reduce GHG emissions intensity and de-couple production growth from emissions growth. For natural gas, with extensive electrification and methane emissions reductions, there is potential to significantly grow production while holding absolute GHG emissions at or below current levels. However, there are a number of transmission infrastructure and commercial challenges that will need to be addressed in this regard, so as to enable the required scope of electrification. For oil sands, GHG emissions intensity reductions are expected to result from ongoing efficiency improvements, the implementation of new extraction processes (particularly for in situ oil sands development) and new production from less emissions-intensive mining projects that do not include up graders. Canadian oil and natural gas exports with lower emissions than competing alternative energy sources in the market will have the effect of reducing overall global GHG emissions. These actions to ensure the carbon competitiveness of Canadian oil and natural gas production, along with use of verified offsets and international credits, would also contribute to aligning Canada’s energy and climate aspirations.

Canada therefore has the opportunity to play a leadership role in the global transition to a lower-carbon energy system/economy, with the vision being: Canada is a preferred supplier of cost-and carbon-competitive oil and natural gas to domestic and global markets, produced with leading environmental and social performance standards.

The competitiveness challenge

Canada continues to have a number of positive attributes in terms of investment attraction, among them the size and quality of the resource, world-class environmental standards, and competitive royalty regimes. However, both industry and the investment community are of the view that the competitiveness of Canada’s oil and natural gas sector is increasingly challenged. Investment is leaving Canada’s oil and natural gas sector and the sector is having difficulty attracting new investment capital. While valuations fluctuate, recent industry data indicates that Canadian liquids-rich natural gas (LRNG) companies are being valued at discounts to their U.S. peers. Many larger producers are shifting investment capital and associated jobs to other jurisdictions. At the same time, small to medium Canadian operators are having significant difficulty attracting financing. Since 2012 the number of junior ($50 million to $500 million) companies has been reduced by almost 50 per cent (from 49 to 25 companies). Canadian equity raised annually has dropped from about $10 billion in 2016 to less than $5 billion in 2017 and only $40 million so far in 2018. The service sector is also mobile and the migration of equipment and experienced personnel to other jurisdictions (particularly the U.S.) is further exacerbating the competitiveness challenge for the upstream oil and natural gas sector in Canada. »

These competitiveness challenges arise from a number of factors, including cost structure, changes in the business investment climate such as tax policy changes in the U.S., constraints on market access and resultant negative impacts on prices, regulatory timelines and complexity, and public perception issues. In particular, Canada faces significant market access problems, preventing growth of production and the associated benefits. For natural gas, Canada is losing market share to the U.S. in areas of Canada and the U.S. traditionally supplied by Canadian natural gas and to date has not participated in the rapid growth of liquefied natural gas (LNG) export markets. For crude oil, Canada’s export pipelines are effectively operating at full capacity. This lack of market access options is being manifested in significant price discounts for Canadian oil and natural gas production. The federal government’s recent announcement regarding the acquisition of the Trans Mountain Pipeline (TMX) is a positive and unambiguous commitment to the importance of market diversification, to getting TMX built and to securing access to global crude oil markets and pricing.

Some of these competitiveness issues reflect broader market conditions (e.g., growth of shale oil and gas disrupting North American market dynamics) and some are reflective of policy and regulatory decisions by federal and provincial governments in Canada. At the same time other competing jurisdictions are acting to make their fiscal regimes and regulatory systems more competitive and efficient, exacerbating the situation in Canada. While these changes in competing jurisdictions may or may not be durable, they are currently having a material impact on investment attraction and capital flows.

Canada is at a critical, time-sensitive juncture in terms of decisions on key oil and natural gas opportunities, and in forging a broader consensus on the future vision for the oil and natural gas industry. Ensuring that Canada remains competitive would re-establish the investor confidence required to attract the capital to sustainably grow the Canadian industry and economy. Potential actions to address this issue are within the purview of both industry and governments, working collaboratively with Indigenous peoples and stakeholders.

**THE COMPETITIVENESS CHALLENGE**

Key indicators of Canada’s competitiveness challenge (prior to addressing opportunity levers) for the upstream oil and natural gas sector are:

- **Comparable U.S. LRNG investments have approximately 2X RATES OF RETURN** (16% versus 9% IRR) and one-to-two-year faster payout.
- **U.S. GoM investments have rates of return 2.5% HIGHER than oil sands investments (> 2X value).**
- **Investment in U.S. oil and natural gas INCREASING** (by about 15% in 2018) while investment in Canadian oil & gas is essentially flat.
- **Ongoing decline in Canadian upstream oil and natural gas investment – FDI in Canada at LOWEST LEVEL SINCE 2010.**
- **Canadian LRNG companies TRADING AT A DISCOUNT** to U.S. peers.
- **Export oil and gas pipelines OPERATING AT FULL CAPACITY.**
- **Significant PRICE DISCOUNTS for both crude oil and natural gas.**
- **Canadian upstream M&A activity was $20 BILLION in 2016, $5 BILLION in 2017, further declined to date in 2018.**

For its part industry has reduced, and continues to reduce, cost structure and address GHG emissions intensity across all areas of the business by seeking efficiencies, and by applying new technology and innovative systems and processes. Innovation and technology will be key to Canada’s future success, but commercialization is an ongoing challenge, in part due to difficulties accessing financing.

However, industry is of the view that these actions alone cannot overcome the competitiveness challenge. Therefore, actions by governments are also urgently required.

This report examines competitiveness for the upstream oil and natural gas sector in four key thematic areas: Business Investment Climate, Market Access, Technology and Innovation, and Branding. Inclusiveness was also addressed. Supporting modelling analysis quantified the impact of some of the potential policy levers at the project level, the sector level and the overall economy level >
EXECUTIVE SUMMARY

Based on the work conducted by Industry (in part through the Joint Working Group) over the past several months, including the results of the modeling outlined above and detailed further in this report, the following key potential actions common to the oil and natural gas sector were identified to improve competitiveness and close the gap vis-à-vis the U.S.:

• Allowing immediate deductibility of capital costs for tax purposes in the year in which they occur, to be applied broadly across the economy while providing the collateral benefit of enhancing the ease of tax compliance and administration, and jointly examining innovative approaches to financing for small to medium sized firms in the upstream oil and natural gas sector;

• Increasing the level of protection to approximately 80 per cent coverage of the aggregate compliance cost for EITE industries including the oil and natural gas sector, in order to address the competitiveness gap with the U.S. and to avoid carbon leakage; and,

• Proceeding with the federal government’s commitment in the 2017 budget to review the Scientific Research and Experimental Development (“SR&ED”) tax credit program, with a view to making it more effective through risk-sharing, inclusion of operational innovation within scope, providing greater certainty with respect to the application process, simplifying the audit process and providing greater support for projects throughout the innovation life cycle.

Additional priority opportunity areas specific to LRNG (including dry natural gas, associated liquids and light oil) for potential action by governments are:

• Continuing to take a leadership role in framing the opportunity for international recognition of Canada’s progress in reducing global GHG emissions via its natural gas exports, and in seeking international credits through trade agreements under Article 6 of the Paris Agreement;

• Enhancing the competitiveness of Canadian natural gas by taking action to reduce pipeline rates and by increasing capacity of Canadian natural gas pipelines serving markets where consumers have a diversity of supply alternative (including accelerating the regulatory review process for NGTL debottlenecking) in order to ensure Canadian gas remains competitive in those markets;

• Visibly supporting and taking action to advance the development of a liquefied natural gas (LNG) industry on Canada’s West Coast, with development of multiple LNG plants over time to provide access to global natural gas markets – the market window will otherwise continue to be seized by LNG projects in other jurisdictions;

• Enabling accelerated collaborative technology and innovation in the sector, particularly as it relates to commercializing electrification of upstream LRNG and downstream LNG facilities and other technologies with potential to reduce costs and GHG emissions (industry recognizes that increasing EITE protection and incenting electrification in some manner may appear to be contradictory potential actions, but this is indicative of the challenges that arise in endeavoring to concurrently address both cost competitiveness and carbon competitiveness as measured by GHG emissions intensity); and,

• Enhancing the reputation/brand of the Canadian natural gas sector by creating a refreshed narrative for the sector – founded on balanced policy, improvement in the industry’s environmental and social performance, Canada’s role in reducing global GHG emissions and the sector’s contribution to economic prosperity in Canada and globally – and communicating and engaging more effectively with Canadian and global audiences using this new narrative.

Additional priority opportunity areas specific to oil sands (including heavy oil) for potential action by governments are:

• Continuing to advance efforts to expand market access for Canadian heavy oil, through support and endorsement of approved pipelines and expansion projects (including TMX, Keystone XL and Enbridge Line 3);

• Undertaking reforms to the regulatory framework in a manner that strengthens investor confidence and encourages long-term investment in energy infrastructure;

• Encouraging oil sands innovation through a combination of fiscal tools, expanded access to government funding for late stage research and development and strengthening linkages among industry, government and academia; and,

• Enhancing the reputation of Canada’s oil sands by developing a narrative that positions the oil sands industry as a key player in Canada’s long-term economic future while being a global leader in innovation and environmental performance. The vision should be supported through a co-ordinated effort with industry, provincial and federal governments, and individual Canadians. The brand should seek to inform, involve, inspire and enroll Canadians to support the development of oil sands and include a focus on accessing world markets, a commitment to innovation, and global environmental stewardship.
The modelling analysis took into consideration key profitability metrics used by industry to make investment decisions. Internal rate of return remains a key indicator of overall profitability for the oil and natural gas sector. However, payout is an increasingly important metric in light of the current realities of market volatility, regulatory uncertainty, fiscal uncertainty and competitiveness relative to other jurisdictions. Investors are increasingly focused on shorter cycle investment opportunities and the timeframe necessary to recover their upfront capital investment. This is essentially a strategy to mitigate uncertainty and risk. The modeling also took into consideration the comparative fiscal and climate policies in jurisdictions (particularly the U.S.) with which Canadian oil and natural gas is competing in the market.

For natural gas, industry modelling of representative play economics demonstrates a measurable competitiveness gap between Canadian liquids-rich natural gas (LRNG) investments and similar opportunities in the U.S. Most of this gap arises from recent U.S. tax regime changes, plus the incremental compliance costs of climate policies in Canada. Economic modeling also demonstrates that implementing the following levers would collectively address the competitiveness gap: immediate tax deductibility of capital costs (which would be broadly applied across the economy), and approximately 80 per cent coverage of the aggregate compliance cost burden for emissions-intensive trade-exposed (EITE) industries.

**INDUSTRY BELIEVES THAT CANADA’S OIL AND NATURAL GAS SECTOR PRESENTS A SIGNIFICANT OPPORTUNITY FOR INCLUSIVE GROWTH THAT PROVIDES BROAD BENEFITS TO CANADIANS AND IS ALIGNED WITH CANADA’S ECONOMIC, ENVIRONMENTAL AND SOCIAL OBJECTIVES.**

For oil sands, modelling of representative long-cycle economics demonstrates a competitiveness gap between Canadian oil sands investments and similar opportunities in the Gulf of Mexico, largely as a result of recent U.S. tax regime changes plus the incremental regulatory cost of climate policies in Canada. Analysis conducted by industry demonstrates that addressing market access issues, largely through the construction of pipelines already approved, will not by itself be enough to resolve competitiveness issues for Canada’s oil sands, nor is it sufficient to offset the incremental climate burden. Additional policy levers would be required to create a competitive business environment, the most effective of which appear to be immediate tax deductibility of capital costs, approximately 80 per cent coverage of the aggregate compliance cost burden for Emissions Intensive Trade Exposed (“EITE”) industries and providing certainty with respect to the implementation of the Clean Fuel Standard.
These potential opportunities for action are outlined in detail in this report, along with supporting modelling results that quantify and illustrate the significant opportunity – particularly in the areas of economic growth and GHG emissions – that arises if action is taken to address these competitiveness issues. In addition, other opportunity areas, including an inclusiveness assessment and targeted infrastructure support (road, rail, electricity transmission) to lower overall costs in the sector, have been identified for both LRNG and oil sands (refer to Appendix B). Some of these opportunity areas are actionable in the near term and some require further review and engagement with a broader group of stakeholders. In addition, more specific proposals to improve the competitiveness of Canada’s potential LNG industry will be forthcoming through the British Columbia Canada LNG Competitiveness Review.

Summary

In summary, industry believes that Canada’s oil and natural gas sector presents a significant opportunity for inclusive growth that provides broad benefits to Canadians and is aligned with Canada’s economic, environmental and social objectives. Potential opportunities for action are identified to address cost competitiveness challenges, to mitigate current price discounts for our oil and natural gas production, to accelerate innovation and to improve the Canadian oil and natural gas brand. These actions would help to ensure Canada remains globally competitive and in turn restore investor confidence, attract investment and provide the platform for a broader consensus on the future of the Canadian oil and natural gas industry, all of which could lead to significant growth of the sector – protecting Canadian jobs and working people, providing opportunities for Indigenous Canadians and contributing to the economic prosperity necessary to support our standard of living and quality of life and to enable transition to a lower-carbon energy system/economy.
SECTION 1: Introduction

The Challenge and the Opportunity
The Joint Working Group Process
The Industry Submission to Governments

Industry Submission to Ministers
2018 Joint Working Group
Liquids rich natural gas and oil sands
The Challenge and the Opportunity:
What is the Future Vision for Canada’s Oil and Natural Gas Industry?

Canada and the world are currently facing a significant challenge in meeting growing demand for energy, while also responding to the impacts of climate change and the need to transition to a lower-carbon energy system/economy over the next several decades.

The world’s demand for energy is expected to continue to grow significantly over the next two to three decades, largely driven by growth in demand in Asia. The recent International Energy Agency (IEA) World Energy Outlook projects that in 2040 oil and natural gas will continue to supply more than half of the global energy demand. Canada has large oil and natural gas resources — natural gas and natural gas liquids, light oil, oil sands and heavy oil — that can continue to play an important role in meeting Canadian and global energy demand.

At the same time, there is an international consensus on the need to address global climate change and to reduce carbon emissions from the global energy system. Canada has committed to work toward significant reductions in greenhouse gas (GHG) emissions, through its commitment to the 2015 Paris Climate Agreement and through the Pan-Canadian Framework on Clean Growth and Climate Change.

On a global scale, oil and natural gas supplied from Canada can increase economic prosperity, improve quality of life and contribute to reducing global carbon emissions, in a manner that is responsible, with Canada among the global leaders in environmental and social performance.

Canadian oil and natural gas can also continue to supply energy to Canadians and contribute significantly to Canada’s ongoing prosperity. Canada’s energy industry is among the largest economic engines driving our economy, both directly and through its linkages to other industries such as petrochemicals and the manufacturing sector. In the Canadian context, the Joint Working Group (JWG) took inspiration in part from the recent Advisory Council on Economic Growth reports Path to Prosperity: Resetting Canada’s Growth Trajectory and Unleashing Productivity Through Infrastructure. These reports highlight the opportunity to unleash growth potential in key sectors such as energy and renewables, to position Canada as a preferred global trading partner, and to unleash productivity through infrastructure development. For Canadians, our oil and natural gas resources can continue to provide secure, reliable and affordable energy supply, while sustaining employment and economic prosperity throughout the value chain. Furthermore, oil and natural gas development presents a tremendous opportunity for inclusive growth and further tangible progress in reconciliation with Canada’s Indigenous peoples.

Canada has the opportunity to play a leadership role in the global transition to a lower-carbon energy system/economy, with the vision being: Canada is a preferred supplier of cost- and carbon-competitive oil and natural gas to domestic and global markets, produced with leading environmental and social performance standards.

Yet the future for Canada’s oil and natural gas industry has become a source of tension and debate, often portrayed as a choice between protecting the environment and addressing climate change versus growing the oil and natural gas sector and the economy. For some, there is a perceived conflict between the continuing use of oil and natural gas to meet growing global demand for energy, and the concurrent need to address global climate change and move toward a lower-carbon economy. For others, oil and natural gas development will be necessary to satisfy growing global demand and contribute to economic prosperity and does not need to come at the expense of responsible environmental stewardship. Recent polling\(^2\) indicates most Canadians want Canada to play a role in meeting the growing global demand for oil and natural gas and contributing to economic growth, while demonstrating environmental and social responsibility and doing its part to address global climate change.

Canada continues to have a number of positive attributes in terms of investment attraction, among them the size and quality of the oil and natural gas resource, world-class environmental standards and competitive royalty regimes. However, industry and the investment community are of the view that the competitiveness of Canada’s oil and natural gas sector is increasingly challenged.

\(^2\) Abacus Data Polling Results, 2018
While our regulations in Canada accomplish various environmental and social objectives, other jurisdictions have less stringent regulations and a resultant competitive advantage. Industry’s view is that among the factors impacting the competitiveness of the Canadian oil and natural gas sector are cost structure, changes in the business investment climate such as revisions to U.S. tax policy, lack of infrastructure, constrained access to markets and the timelines and complexity of some aspects of the existing regulatory frameworks. Some of these issues reflect broader market conditions (e.g., growth of shale oil and natural gas disrupting North American market dynamics) and some are reflective of policy and regulatory decisions by governments. At the same time other jurisdictions (particularly the U.S.) are making their fiscal regimes and regulatory systems more competitive and efficient, further impacting the competitiveness of the Canadian industry. While these changes in competing jurisdictions may or may not be durable, they are currently having a material impact on investment attraction and capital flows.

The dialogue within Canada regarding the future of the oil and natural gas industry continues to evolve. The federal government’s recent announcement regarding the acquisition of the Trans Mountain (TMX) Pipeline is a positive and unambiguous step toward getting TMX built and securing access to global crude oil markets and pricing. This decision may encourage broader public alignment around the middle ground, but it may also exacerbate opposition to the project as it moves toward construction. The visible ongoing negative framing of the oil and natural gas sector by some constituencies continues to impact both our international brand and public confidence in the oil and natural gas sector in Canada, both of which negatively impact the competitiveness of the sector.

For these reasons, Canada is at a critical, time-sensitive juncture in terms of decisions on key oil and natural gas opportunities, and in forging a broader consensus on the future vision for the oil and natural gas industry and the integration of our related environmental (particularly climate), economic and social objectives. Ensuring that Canada remains competitive would re-establish the investor confidence required to attract the capital to sustainably grow the industry (including representatives from the Canadian oil and natural gas industry (including representatives from both the producing sector and the service sector).

The Joint Working Group Process
In the fall of 2017 the Minister of Natural Resources Canada convened a Joint Working Group (JWG) consisting of representatives from Natural Resources Canada (NRCan), Finance Canada, and Environment and Climate Change Canada (ECCC), the provinces of Alberta, British Columbia and Saskatchewan, and a cross-section of representatives from the Canadian oil and natural gas industry (including representatives from both the producing sector and the service sector).

The JWG initiative was envisaged to complement other federal initiatives assessing Canada’s competitiveness:

- **Generation Energy**, developing a vision for Canada’s energy future, linked to the Pan Canadian Framework on Clean Growth and Climate Change, and to chart the path forward by which the transition to a lower-carbon energy system/economy might be advanced in Canada over the next generation.
- **Resources for the Future Economic Strategy Table**, one of six Economic Strategy Tables, this group is guiding federal efforts to shape Canada’s future economic growth in Canada’s resource sector, to create conditions for long-term growth that lead to new business opportunities and middle-class jobs for Canadians.
- **Atlantic Offshore Competitiveness Roundtable**, which brings together the federal government, provinces, and industry to discuss challenges to competitiveness in the offshore petroleum sector and measures parties can take to improve the investment climate.
- **British Columbia Canada LNG Competitiveness Review**, a collaborative effort between the B.C. and federal governments and the liquefied natural gas (LNG) sector to better understand and work collaboratively to address a competitiveness gap between Canadian and U.S. Gulf Coast LNG.

The JWG was tasked with the following objectives:

- **Examine** issues affecting the competitiveness of the upstream oil and natural gas industry in Canada, including natural gas, liquids rich natural gas (LRNG), light tight oil, oil sands and heavy oil;
- **Build** a common understanding of the factors that influence investment, including the trade-offs investors and businesses consider when making investment or project decisions;
- **Promote** Canada’s comparative advantages in terms of oil and natural gas investment; and,
- **Discuss** opportunities to promote the Canadian energy brand, including technological innovation to support the transition to a lower-carbon energy system/economy.

The report of the JWG was completed and submitted in August 2018. »
The Industry Submission to Governments

This industry submission to governments builds on and extends the work of the JWG. In developing this report and recommendations, industry took into consideration input and feedback provided by government representatives during the JWG process. However, the report is the responsibility of industry alone. The government representatives on the JWG have not committed to take action to address the “competitiveness gap,” nor did they endorse the potential actions outlined in the opportunity areas. For further clarity, participation by government representatives in the JWG process has been without prejudice to any future decisions that may be taken by governments and to any further analysis and modeling governments may decide to conduct regarding the competitiveness of the Canadian upstream oil and natural gas sector.

This report is written for an informed and knowledgeable target audience, but with the expectation that the report would be available in the public domain.

While the broad subject matter areas are the same and some of the key themes are similar, a number of the specific issues and areas of opportunity differ (in some cases significantly) for each of LRNG and oil sands. For these reasons, the LRNG and oil sands streams are presented separately for much of the report. However, we recognize that the sector is often viewed holistically, and an integrated view is therefore presented in the Executive Summary, in the Introduction, in the Business Investment Climate section, and in the Inclusiveness Assessment section of the report.

The report is organized as follows:

• A joint overview of the business investment climate impacting the oil and natural gas industry and potential areas for action to address current competitiveness challenges. Note that for purposes of this report “LRNG” is intended to be broadly inclusive of natural gas, associated liquids and light oil, and “oil sands” is intended to be broadly inclusive of heavy oil.
• A joint summary of the Inclusiveness Assessment.
• Separate assessments of several key areas – Context, Market Access, Technology and Innovation, Summary of Modeling Results and Branding for each of LRNG and oil sands.
• Conclusions for each of LRNG and oil sands.
• Appendices that provide further detail in support of the findings outlined in the report, including a detailed description of the modeling results for each of LRNG and oil sands.
• A glossary of terms is provided in Appendix A. A complete summary of the potential areas for action is provided in Appendix B.
Business Investment Climate

Context
The upstream oil and natural gas sector in Canada is comprised of a broad range of companies, reflecting varying global exposure, geographic diversity, investment time horizons, financial capacity, value chain exposure, and ability to mitigate uncertainty and risk. Companies active in Canada range from multi-nationals with global exposure to small entrepreneurial Canadian companies with very limited capacity for capital mobility. In addition, the upstream oil and natural gas sector is comprised of a diverse service sector that provides significant employment and contributes to innovation. The service sector is subject to many of the same competitiveness considerations. Capital, people and equipment are mobile and Canadian companies must be efficient to compete for investment capital relative to other jurisdictions.

Investment decisions are made with consideration for a number of factors. First is overall profitability based on discounted cash flow analysis, with metrics including internal rate of return, profitability index and the level of break-even price. Second is an assessment of the time necessary to recover upfront capital investment, with the key metric being payout. The third area for consideration is strategic fit and an assessment of uncertainty and risk, particularly that which is related to above ground factors. These latter factors are more qualitative in nature but can have a significant impact on investment decision-making.

Given the current very challenging circumstances in regard to the investment in the upstream oil and natural gas sector in Canada, there is an increasing orientation to shorter cycle investments and risk mitigation by increasing the weighting on payout as a key profitability metric. Companies (and investors) need to manage uncertainty and risk by ensuring that upfront capital investment can be recovered in a timely manner.

Industry considered both the basis upon which investment decisions are made and the key variables impacting these decisions in conducting its assessment of the competitiveness of the upstream oil and natural gas sector. This led to the key focus areas outlined in this report.

For a number of reasons, including market dynamics and commodity price trends, regulatory complexity and uncertainty, market access challenges, tax policy and the rising cost of doing business (including regulatory costs), Canada’s oil and natural gas sector has experienced reduced investor confidence over the past several years.

The result has been dramatic, with significantly reduced foreign direct investment. While valuations are volatile and influenced by numerous factors, recent industry data indicates that Canadian LRNG companies have been trading at a significant discount to their U.S. peers. Market conditions and cost issues unique to the Canadian oil and natural gas sector have played a role in this shift in competitiveness, but industry is of the view that government policy and regulatory actions have also been a factor in diminishing Canada’s relative competitiveness position and negatively impacting investment attraction. For this reason, both industry and governments need to take action to improve the business investment climate for the oil and natural gas sector.

Recent investment trends are reflected in the following charts.

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GLOBAL UPSTREAM EXPLORATION AND DEVELOPMENT (E&D) CAPEX YEAR-OVER-YEAR

Where is the investment going? Focused U.S. spending is up while focused Canadian spending is essentially flat.

Source: Wood Mackenzie, company reports
Upstream oil and natural gas investment in Canada is now expected to decline in 2018, at a time when global energy demand and upstream investment is projected to rise.

**SUMMARY OF UPSTREAM GLOBAL SPENDING**

Lower valuation has happened principally in the last two to three years, reflecting lack of investor confidence in Canada (egress challenges severely reducing commodity pricing and a lack of confidence in Canada’s ability to grow).  

Source: Industry analysis with data from Thompson Reuters EIKON, March 2018

Proposed Actions to Address the Competitiveness of Canada’s Upstream Oil and Natural Gas Sector
While global long-cycle spending as a proportion of total upstream investment continues to be on the rise, the proportion of oil sands spending is on the decline, with total annual spending expected to decrease for a fourth consecutive year. Exacerbating the recent competitiveness challenges faced by Canada are the recently enacted U.S. tax reforms, including:

• Allowing temporary immediate deductibility of capital cost for certain tangible capital investments; and,
• A drop in the federal corporate income tax rate from 35 to 21 per cent.

While Canada previously benefited from an overall competitive advantage with respect to tax, it now finds itself trailing the U.S. on many key factors which impact investment attraction. Refer to Appendix C for a discussion of the U.S. tax reforms and their applicability to the upstream oil and natural gas sector.

The industry is reducing its cost structure across all areas of the business by seeking efficiencies, by applying new technology, and by applying innovative systems and processes.

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Source: Rystad Energy

* Rystad’s estimate of global upstream spending includes capital expenditures associated with wells, facilities, exploration, and abandonment and operating expense associated with taxes, SG&A, transportation, and production.
However, industry does not expect these actions alone to be sufficient to mitigate the competitiveness challenge, as companies in other jurisdictions are also pursuing similar cost efficiencies in reaction to the low commodity price environment experienced over the past several years.

**Opportunity Assessments**

1. **Fiscal Policies**

a) **Immediate Capital Deductibility**

Tax systems allow all industries to depreciate the cost of their capital investments against income on a defined schedule. In Canada the capital cost allowance (CCA), or depreciation, rates for key oil and natural gas assets range from 4 to 30 per cent on a declining balance basis. In contrast, the U.S. recently provided all industries with immediate expensing of capital costs in the year the asset is placed into service, for assets with a depreciation schedule of 20 years or less. This provision is applicable until 2023, at which time this measure will begin to be phased out. Industry has determined that oil and natural gas industries in the U.S. qualify for this immediate expensing provision.

A faster depreciation schedule improves industry’s project economics by reducing tax liability in the earlier years of a project. It also provides for significantly reduced investment uncertainty and risk, as companies can achieve project payout sooner and thereby increase the likelihood of, at a minimum, recovering their initial investment.

As a further substantial ancillary benefit, industry is of the view that with U.S. tax reform on tangible capital there will be an increase in ease of tax compliance and administration for the taxpayer and the Internal Revenue Service (refer to Appendix D). In Canada, disputes between taxpayers and the Canada Revenue Agency (CRA) frequently arise with regard to the proper classification of assets. Capital class distinctions are a significant portion of oil and natural gas taxpayer disputes, as most large oil and natural gas corporate taxpayers surveyed have at least 40 per cent of their CRA disputes arise from CCA class issues. Allowing immediate capital deductibility would reduce the complexity of the key oil and natural gas industry CCA class distinctions by virtue of allowing all eligible assets to be deducted at the same rate. This would have a positive impact on challenges that otherwise exist for taxpayers.

With regard to accelerated CCA schedules, industry is very much aware of the ongoing attention being afforded the issue of inefficient fossil fuel subsidies. While industry does not agree with the manner in which fossil fuel subsidies are often characterized, in this particular circumstance the immediate expensing of capital could apply equitably to all industries broadly across the economy (as the U.S. did in its recent tax reform).

b) **Corporate Income Tax Rate**

The combined federal and provincial corporate income tax rate for Alberta and B.C. is 27 per cent, while the average U.S. combined federal and state corporate income tax rate is now 25.75 per cent (Texas, which draws the bulk of U.S. oil and natural gas investment, is now at a combined federal and state tax rate of 21 per cent).

**Observations**

Industry-led financial modeling detailed later in this report illustrates the significant impact that immediate capital cost deductibility has on addressing the Canadian competitiveness gap, in terms of both rate of return and a payout. In addition to simplifying the Canadian tax system as it applies to the oil and natural gas sector for capital investments, of the levers evaluated (and all else being equal) immediate capital write-off is considered the single most impactful fiscal action that the government could take to improve investment attractiveness across the breadth of the Canadian economy. Based on the industry-led modeling analysis, this action would address approximately 40 per cent of the competitiveness gap between the U.S and Canada for the upstream oil and natural gas sector.

Reducing Canada’s overall corporate income tax rate by 1 per cent (and thereby matching the U.S. average rate) would also provide a positive investment signal but has a lesser impact on overall investment attractiveness.

» OF THE LEVERS EVALUATED, IMMEDIATE CAPITAL WRITE-OFF IS CONSIDERED THE SINGLE MOST IMPACTFUL FISCAL ACTION.
Smaller oil and natural gas firms face the same competitiveness challenges as those faced by larger firms. However, their ability to mitigate these competitiveness challenges is often limited by a lack of capital mobility, balance sheet strength and/or a lack of investment portfolio breadth and flexibility to spread risk. As a result, many of these firms are currently experiencing challenges in obtaining financing for growth opportunities. Industry is of the view that these smaller firms are an important element of the upstream oil and natural gas sector in Canada, yet many have ceased operations over the past several years and others are on a similar path. There is an opportunity for industry and governments to jointly examine innovative approaches to financing, so as to contribute to the ongoing viability of this sector of the industry.

**OPPORTUNITY AREA**

The industry modelling illustrates that a key lever to improving competitiveness would be the immediate expensing of capital in the year of investment for all industries, including the oil and natural gas sector, to improve global competitiveness.

Two other potential levers exist for consideration by governments. The first is a broad adjustment to the overall corporate income tax rate, which would have a positive impact on larger firms but would have limited benefit to smaller firms. The second is to enable innovative approaches to financing for smaller oil and natural gas firms. Flow-through shares are an example of one such mechanism that has been used previously to allow these firms to access equity to enable growth and an ongoing contribution to Canada’s economy.

c) Innovation – Federal Scientific Research and Experimental Development Improvements

Industry is of the view that the policy intent behind Canada’s Scientific Research and Experimental Development (SR&ED) program has been to encourage Canadian businesses of all sizes and in all sectors to conduct research and development (R&D) that will advance through the course of operations. This type of innovation is critical to LRNG, especially in the early stages of unconventional resource play development where companies must invest significant capital to optimize the approach to development (for example, field piloting of optimal well density and/or completion techniques for efficient resource recovery). The critical learnings that are obtained in the first 10 to 15 per cent of development will be applied to the vast majority of development, yet field-based innovation is generally out of scope for SR&ED eligibility. In the current low commodity price environment and risk-averse business investment climate, industry is of the view that it is both difficult and inequitable for companies to fully shoulder the burden of upfront operational innovation required to maximize revenues for both industry and government (through taxes and royalties) in the resource development. There is an opportunity to reshape the SR&ED program to recognize the importance of, and to better support, operational innovation. Doing so would appropriately share the risks between industry and government and enable greater industry expenditures on field-based innovation to the benefit of both government and industry. It is interesting to note that, in a similar fashion, the Alberta government recognized the importance of supporting early stage play learning through their Strategic Royalty Program, which provides for reduced royalty rates during the early stages of play development.

Industry finds the current SR&ED program to be a somewhat risk-averse, administratively onerous program that provides limited certainty regarding eligibility of expenditures (given the nature of SR&ED claims, which are made post-expenditure, being able to be challenged by CRA up to three years post-submission). Further, limitations on expenditure eligibility provide a bias toward small- and medium-sized enterprises (SME) and labour-intensive sectors, curbing the benefit for capital-intensive sectors such as LRNG and oil sands. Recent changes to the SR&ED program policy, which have significantly reduced the program benefits, have exacerbated the situation and further reduced the relevance of the SR&ED program to the oil and natural gas sector.

Commercialization of technologies in the oil sands often requires the construction and operation of a demonstration facility. Current market conditions make it very difficult for companies to spend the capital on the demonstration facilities required to commercialize new technologies, due to the drain on cash flow during the commercialization stage of technological development coupled with the inability to attract capital investment into the industry. The SR&ED program needs to consider how to better support development of technologies up to the commercialization phase.

The SR&ED program does not generally include innovation advanced through the course of operations. This type of innovation is critical to LRNG, especially in the early stages of unconventional resource play development where companies must invest significant capital to optimize the approach to development (for example, field piloting of optimal well density and/or completion techniques for efficient resource recovery). The critical learnings that are obtained in the first 10 to 15 per cent of development will be applied to the vast majority of development, yet field-based innovation is generally out of scope for SR&ED eligibility. In the current low commodity price environment and risk-averse business investment climate, industry is of the view that it is both difficult and inequitable for companies to fully shoulder the burden of upfront operational innovation required to maximize revenues for both industry and government (through taxes and royalties) in the resource development. There is an opportunity to reshape the SR&ED program to recognize the importance of, and to better support, operational innovation. Doing so would appropriately share the risks between industry and government and enable greater industry expenditures on field-based innovation to the benefit of both government and industry. It is interesting to note that, in a similar fashion, the Alberta government recognized the importance of supporting early stage play learning through their Strategic Royalty Program, which provides for reduced royalty rates during the early stages of play development.

Industry recognizes that there will need to define what is truly field-based innovation eligible for SR&ED support, versus actions representing business as usual.

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4 *Beyond Survival: Shifting the mindset to thrive in a new O&G landscape,* Grant Thornton, 2017
However, it is possible to get the balance right, and in doing so provide the right level of support, risk sharing and certainty to encourage the critical field-based innovation that will result in significant benefits to industry and governments.

OPPORTUNITY AREA

Accordingly, there is an opportunity to increase the effectiveness of SR&ED, specifically by:

• Proceeding with the government’s pledge to review SR&ED as stated in the 2017 budget and to establish a process and critical path for the review to provide clarity and transparency, with the first steps being the exploration of opportunities to make SR&ED more effective by:
  • Risk-sharing, through inclusion of operational innovations within program scope;
  • Providing greater certainty with respect to the application process;
  • Simplification of auditing processes; and,
  • Greater support for advancement of innovation projects from early life to the commercial stage.

• Exploring the reinstatement of capital expenditure eligibility to include capital expenditures on emissions-reduction technology, climate impact mitigation and other innovative expenditures, including field-based innovation.

• Modernizing the SR&ED program to create equity among firms in terms of access to incentives, by extending the equivalent investment tax credit (ITC) benefits that are available to Canadian-controlled private corporations (CCPCs) under SR&ED to all firms, to enhance the ability of larger firms to leverage R&D and unleash its spillover effects.

2. Climate Related Policies

Canada is a signatory to the 2015 Paris Climate Agreement and subsequently reached agreement with most provinces on the Pan-Canadian Framework on Clean Growth and Climate Change in late 2016. These agreements outline Canada’s current commitments to address climate change.

A BASIC TENET OF CLIMATE POLICY MUST BE TO PROVIDE INCENTIVE FOR INDUSTRY TO REDUCE GHG EMISSIONS, WHILE ADDRESSING THE COMPETITIVENESS IMPACTS FOR EMISSIONS-INTENSIVE, TRADE-EXPOSED SECTORS.

CANADA’S CLIMATE COMMITMENTS

• Limit global warming to well below 2 degrees Celsius above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5 degrees Celsius.
• Reduce carbon emissions 30% below 2005 levels by 2030, with deeper reductions thereafter.
• Opportunity to cooperate with other countries when implementing nationally determined contributions (NDCs) using market-based climate change mitigation mechanisms such as international credits (per Article 6).

Pan-Canadian Framework on Clean Growth and Climate Change (2016)
• Carbon pricing in all Canadian jurisdictions by 2018.
• Accelerated nationwide coal phase-out by 2030.
• Nationwide strategy for electric vehicles by 2018 plus accelerated deployment of charging infrastructure.
• Implementation of a federal Clean Fuel Standard.
• Establishment of a nationwide net-zero energy building code by 2030, and energy use labelling for buildings by 2019.
• Renewed support for industrial net-zero energy efficiency, including adoption of energy management systems.
• Reduction in methane emissions from the oil and natural gas sector of 40 to 45% by 2025.

As the oil and natural gas sector in Canada looks to become more competitive and contribute to Canada’s economic prosperity, it is cognizant of its responsibility to reduce its GHG emissions intensity and become more carbon competitive relative to other jurisdictions.

a) Treatment of Emissions Intensive Trade Exposed Sectors

While industry is broadly supportive of the climate policy goals and policy frameworks being implemented by Canadian governments, the aggregate effect of the various components of Canadian climate policy (including the cost impacts arising from carbon pricing, methane abatement and clean fuel standards) on Canadian competitiveness is a serious concern to industry. The industry believes that a basic tenet of climate policy must be to provide incentive for industry to reduce GHG emissions, while addressing the competitiveness impacts for emissions-intensive, trade-exposed (EITE) sectors that are competing in the open market with companies operating in jurisdictions with less stringent climate policy.

Without appropriate measures to address EITE sectors, carbon leakage could occur. Carbon leakage occurs when production and investment shifts from jurisdictions with more stringent carbon policy (such as Canada) to jurisdictions with no carbon policy or with
lower carbon policy standards (such as Venezuela, Saudi Arabia, Russia, or many parts of the U.S.). This means no overall reduction of overall global emissions (or in fact a potential increase in global emissions), because international demand that could be met with responsibly produced Canadian oil and natural gas will be filled by other global energy sources that may be produced with less environmental regulation and potentially higher emissions.

Furthermore, there is a lack of consistent policy approaches towards EITE protection across the components of climate policy (e.g., carbon pricing, methane emissions reductions, clean fuel standards) and across Canadian jurisdictions, leading to substantive competitiveness gaps and adding to the complexity for companies operating across jurisdictions.

**OBSERVATIONS**

When taken as a whole (carbon pricing, methane emissions reductions, clean fuel standards), industry-led modeling indicates that EITE protection of approximately 80 per cent coverage of aggregate costs related to climate policy is required in order to address the competitiveness gap with the U.S. This assumes that the immediate capital deductibility discussed above is also implemented. Furthermore, assuming that industry solely absorbs the cost impact of methane emissions regulations, effectively 100 per cent EITE protection would be required on clean fuel standard and carbon price impacts in order to address the competitiveness gap vis-à-vis the U.S. Further detail in this regard is included in the modelling sections and in Appendix E.

Industry recognizes that the federal government has recently taken action to improve the level of EITE coverage and to defer the implementation of some provisions of the clean fuel standard. These measures are helpful and move toward the outcome required to address the competitiveness challenge for the upstream oil and natural gas sector as it relates to climate policy.

**OPPORTUNITY AREA**

With consideration for the proposed measures regarding EITE sectors across Canadian jurisdictions, the potential for the federal government to work with the provinces to address the remaining competitiveness gap relative to competing jurisdictions has been identified as a key competitiveness opportunity in this area. Industry modeling indicates this will require an increase in the level of protection afforded to EITE industries. Approximately 80 per cent coverage of the aggregate costs related to climate policy is required. Furthermore, there is scope to improve efficiency and reduce complexity by aligning policies across Canadian jurisdictions.

b) Canada Wide Offset System

A carbon offset is a market-based mechanism that provides a credit for GHG reductions achieved by one party that can be purchased and used to compensate (offset) the emissions of another party. When an offset is purchased, it funds GHG reductions.

A well-designed offset system can support competitiveness by providing an incentive for the development of project-based GHG reductions (electrification, methane abatement, energy efficiency, carbon capture and storage) across the economy, providing high quality, lower cost compliance options to regulated facilities/sectors and lowering the societal economic cost of achieving the reductions.

Offset systems exist in various jurisdictions across Canada. However, jurisdictional design constraints and the fact that the provincial systems are not linked mean that they may not work as efficiently or effectively as they might otherwise.

c) International Emission Reduction Credit Sharing

Article 6 of the Paris Agreement allows Parties to pursue voluntary cooperative approaches that provide for internationally transferred mitigation outcomes being applied toward nationally determined commitments (NDCs), promote sustainable development, and ensure environmental integrity and transparency.

Sharing of emissions credits from lower-carbon Canadian exports would provide a verifiable line of sight for the Canadian public and stakeholders / environmental non-government organizations (ENGOs) around management of Canada's national GHG emission targets and international emission reductions.

While there will be challenges in pursuing this objective — including the fact that the international credit system is in the formative stages and that it would be necessary to convince potential partners to share credits accruing from GHG reductions realized through the displacement coal-fired generation with Canadian LNG — the value proposition is compelling, and it is in Canada's interest to continue to take a leadership role in this regard.

**OPPORTUNITY AREA**

Canadian oil and natural gas exports with lower emissions than competing alternative energy sources in the market will have the effect of reducing overall global GHG emissions. It is important for Canadians to recognize these broader benefits and that Canada pursue international recognition for progress it makes in reducing the GHG emissions of its energy exports. Article 6 of the Paris Agreement includes this provision and the federal government should continue to take a leadership role in framing this opportunity and in seeking international credits via trade agreements.
Inclusiveness Assessment

This inclusiveness assessment examines the potential impacts that addressing competitiveness and enabling growth of Canada’s oil and natural gas sector could have on various under-represented groups of the Canadian population, including women, Indigenous peoples generally, Indigenous women more specifically, visible minorities, and immigrants.

Government and industry sources/data were drawn upon to inform the analysis, and to gain a high-level understanding of the current extent of industry’s inclusiveness, including areas of strength, gaps, challenges, and barriers to entry these under-represented groups may face in the sector, and efforts being made to address gaps, challenges or barriers. It was designed with the goal of aligning with the government’s approach in this area, which involves conducting a gender-based analysis (GBA+) at the development stage of any new government program, policy or initiative.

Growth of the oil and natural gas sector would require additional labour force participants and further partnerships with Indigenous communities. Predicated on competitiveness challenges for the sector being addressed and enabling growth, this analysis indicates inclusive growth is possible for the oil and natural gas industry.

Overview

Addressing competitiveness and enabling growth for the oil and natural gas industry in Canada offers significant opportunities for growth in middle-class jobs and broader economic prosperity for Canadians. In turn, the sector would need a diverse pool of talent to meet growing demand for labour. Forecasts already indicate that labour shortages may arise alongside growth of activity in the oil and natural gas sector, particularly in traditionally male-dominated fields such as highly-skilled trades and technologist roles, engineering, and manager-level roles.7

The oil and natural gas industry offers many middle-class jobs requiring post-secondary education. The oil and natural gas services sector also offers well-paying skilled jobs, many of which offer career opportunities and do not require a university degree. Between 2006 and 2016, Canada’s oil and natural gas workforce became more highly educated, showcasing industry’s ability to continue to evolve and develop talent to compete in an increasingly skilled economy. To a greater extent than Canada’s total workforce, the proportion of oil and natural gas workers lacking a high school diploma declined from 16 to 8 per cent, while workers with a university degree increased from 19 to 26 per cent.8

While the oil and natural gas industry creates many middle-class jobs, systemic barriers inhibit inclusive employment in the sector. It was observed that a number of federal, provincial and industry-led programs are already underway to address these issues. However, while we acknowledge that we are not aware of all current programs, gaps appear to exist in targeted programs for under-represented groups.

This report examines existing data, both on the participation rates of these under-represented groups in the oil and natural gas sector, and where available, the key occupation areas for the sector (e.g. science, technology, engineering and mathematics - STEM).

Key findings include:

Women:

• Women make up almost half of the total national workforce today (48 per cent), however, at 22 per cent share of the workforce, their representation in the upstream oil and natural gas sector is significantly lower.

• The majority of the occupations in the sector require STEM training. Women currently make up 21 per cent of those in STEM programs and 11 per cent of new registrants in inter-provincially recognized Red Seal skilled trades.

• Efforts are underway to improve these participation rates. Upstream oil and natural gas firms have committed millions of dollars to programs and organizations such as the Canadian Centre for Women in Science, Engineering, Trades and Technology (WinSETT Centre), Young Women in Energy (YWE), Women Building Futures (WBF), and Girls in Science. Many companies have also established internal workplace groups to support the goal of creating a respectful and inclusive work environment.

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7 A Labour Market Outlook 2017 to 2021 by ENFORM
8 Ibid.
Indigenous Peoples:
- The oil and natural gas sector is a major economic driver and important local employer for many Indigenous communities. Indigenous peoples represent 6 per cent of the oil and natural gas industry’s labour force, compared to 4 per cent in all other industries.
- Participation of Indigenous people in the trades is about 5 per cent of apprentices in Canada.
- Growth in the sector offers significant partnership opportunities with Indigenous communities. The Indigenous population has grown by over 42 per cent since 2006, which is more than four times the growth rate of the non-Indigenous population over the same period (although some of this growth is due to increased rates of self-identification as Indigenous). The Indigenous population in Canada is projected to exceed 2.5 million persons in the next two decades.
- Internship programs have been created to bridge Indigenous youth interested in working toward a career in the oil and natural gas industry. Recruitment strategies have been structured to include special efforts to reach out and attract a full range of qualified and diverse individuals — including those who might not have been reached through traditional methods and those who might not have previously considered a career in the energy sector.
- Preliminary analysis of reports under Natural Resources Canada’s Extractive Sector Transparency Measures Act (ESTMA) suggests that oil and natural gas companies reported a total $75 million ($55 million from conventional oil and natural gas and $20 million from the oil sands) in reportable payments to Indigenous governments in Canada for the June 1 to December 31, 2017 period. These payments may be made as part of Impact Benefit Agreements (for example, to build a community centre), as royalties (in situations where the Indigenous government has title to the oil and natural gas resource being developed), or as part of a Socioeconomic Agreement (for example, payments to an Indigenous development corporation), among other possible payment types. Due to the nature of reporting under ESTMA, this is likely a conservative estimate of payments to Indigenous governments made by oil and natural gas firms.
- Oil sands companies purchased $3.24 billion from 399 Indigenous-owned businesses in 2015-16 and contributed $48.6 million to communities in support of education, sporting and cultural events. Total funding for Indigenous consultation capacity from the oil sands producers for 2015-16 was $40.79 million.

Indigenous Women:
- While 52 per cent of the Indigenous population in Canada are women, much of the focus of Indigenous communities and the oil and natural gas industry has been on those Indigenous women living on reserves. In fact, 70 per cent of Canada’s Indigenous population now live in urban centers and more attention should be directed to this group of Indigenous women for employment and/or economic opportunities.
- Participation rates for Indigenous men in the sector (6.3 per cent) are significantly higher than that of Indigenous women at 1 per cent.11
- Industry’s support of Women Building Futures (WBF) includes support for Indigenous women, as 35 per cent of WBF graduates are Indigenous women.

Industry recognizes that resource development may also create unintended social and economic impacts (for example, social isolation and strain caused by long work hours) and may also pose certain risks to resource communities associated with the influx of a very large, mostly male transient workforce. Efforts by governments and industry are underway to address these issues, but there are opportunities to mitigate these impacts and ensure the sector’s growth benefits all Canadians.

FUTURE GROWTH OF THE UPSTREAM OIL AND NATURAL GAS SECTOR WOULD PROVIDE UNDER-REPRESENTED GROUPS WITH THE OPPORTUNITY TO PARTICIPATE IN THE GROWING WORKFORCE.

Other Under-represented Groups:
- Between 2006 and 2016, the visible minority share of employees nearly doubled in the upstream oil and natural gas workforce, from 7 to 13 per cent.12
- The share of immigrants in the oil and natural gas workforce increased four percentage points to 16 per cent between 2006 and 2016 — a faster increase than in the overall workforce.13

7 This is the first reporting period for payments to Indigenous governments and does not capture payments made in the first half of 2017. Indigenous organizations must meet certain criteria to be considered governments, and only payments to an individual payee totaling more than $100,000 are reported. The payments must be related to the commercial development of oil and gas.
8 StatsCan, National Household Survey, 2011, Table 14
10 Ibid.
Conclusion

Future growth of the upstream oil and natural gas sector would provide under-represented groups – notably women, Indigenous peoples generally and Indigenous women more specifically, visible minorities, and immigrants to Canada – with the opportunity to participate in the growing workforce. In addition to addressing gender inequality concerns in the sector, this offers further partnership opportunities with Indigenous communities, building on the industry’s past contributions to these communities and consistent with the government’s reconciliation agenda.

While existing data shows that gaps remain, this is an opportunity for both government and industry to enable inclusive growth and provide strong middle-class jobs, by building on existing government and industry programs designed to address many of these issues and pursuing further targeted initiatives.

OPPORTUNITY AREA

There is an opportunity for federal and provincial governments, as well as industry, to partner with Indigenous peoples to promote inclusive growth for the upstream oil and natural gas sector, specifically building on/developing targeted programs to increase participation of Indigenous women, who are largely under-represented in the sector. A collaborative effort will be required to design programs to increase the overall participation of under-represented groups in the sector’s workforce.
SECTION 3: Liquids Rich Natural Gas

Context
Market Access
Technology and Innovation
Summary of Modelling Results
Branding
Conclusions

Industry Submission to Ministers
2018 Joint Working Group
Liquids rich natural gas and oil sands
Canada has the opportunity to play a leadership role in the global transition to a lower-carbon energy system/economy, with the vision being: Canada is a preferred supplier of cost- and carbon-competitive natural gas and light hydrocarbons to domestic and global markets, produced with leading environmental and social performance standards.

Canada and the world are currently facing a significant challenge in meeting growing demand for energy, while responding to the impacts of climate change and the need to transition to a lower-carbon energy system/economy over the coming decades. At the same time, our energy system must continue to provide reliable and affordable energy to consumers.

We are at an energy crossroads in Canada. Decisions are being made on key natural gas growth opportunities and there is a need for a stronger national consensus on the role of natural gas and light hydrocarbons in Canada’s energy system, and on Canada’s role in providing natural gas to global markets. There is currently a generational opportunity for action that could better the quality of life for people both here at home and abroad.

Global energy trends show that energy demand will continue to rise with the global population. Liquids-rich natural gas (LRNG) and light tight oil (LTO) will continue to be important parts of the global energy mix.

Natural gas demand is expected to increase significantly in the next two to three decades, as the world endeavours to balance energy development with the transition to a lower-carbon energy system/economy.

As the fifth-largest producer of natural gas in the world, with a global scale and world-class natural gas, natural gas liquids and light oil resources, Canada has an opportunity to continue to be a significant supplier in meeting both domestic and global natural gas demand. Canada’s natural gas resource can help other countries meet their economic objectives, by providing affordable, secure and reliable energy, and at the same time contribute to meeting their climate goals by providing a less emissions-intensive energy supply.

For Canadians, this resource can provide secure, reliable and affordable energy supply, while providing a significant number of well-paying jobs, economic prosperity and tax and royalty revenue to governments.

This will not be accomplished if there are too many barriers to development that erode our global competitiveness, allowing other jurisdictions (particularly the U.S.) to capture this demand and realize the related economic and social benefits. Industry and governments should work together to lower global GHG emissions and support the continuing transition to a lower-carbon future – by addressing competitive issues such as cost and carbon intensity, by resolving market access issues and capacity constraints in the short and long term, and by improving the domestic and global branding of our natural gas products and services.

There is a misperception that energy development comes at the expense of environmental stewardship and that use of conventional forms of energy is incompatible with the transition to lower-carbon energy system/economy. Neither is the case, but framing the issue this way reinforces conflict and has negative repercussions for Canada’s global brand and competitiveness.

We have leading environmental standards, transparency and enforcement mechanisms. According to a recent survey by Worley Parsons, Canada is a global leader in environmental regulation stringency (second only to Australia) and in compliance (first) and transparency (first).

One of the key challenges to realizing the natural gas opportunity is addressing the issue as to how growth of the natural gas sector fits within Canada’s GHG reduction commitments. Industry acknowledges that increasing domestic natural gas and light oil production will make it more challenging to meet Canada’s ambitious GHG reduction targets, but it is also important to look at this issue in a broader context:

- Canada (and particularly Alberta and B.C.) has climate policies among the most stringent in the world;
- Natural gas producers have been focused on decreasing carbon intensity, in large part through methane abatement measures and electrification of upstream facilities (recognizing that both must be done in a cost-effective manner), and Canadian natural gas production and potential LNG exports are among the global leaders in performance as measured by GHG emissions intensity;
- Canadian natural gas exports can displace alternative sources of supply with higher GHG intensity and reduce global GHG emissions, in both cases addressing what is in fact a global rather than regional or national issue; and,
- Article 6 of the Paris Agreement includes provisions to address the potential implications of displacing high-carbon suppliers with lower-carbon supply sources, providing an opportunity for Canada to more clearly communicate this provision and the inherent benefit to global GHG emissions, and to seek international recognition for its superior natural gas products in the form of international credits negotiated in trade agreements.

Canada can be a competitive, responsible supplier of lower-carbon natural gas to a world in need of energy — supporting a growing middle-class population and reducing energy poverty domestically and globally. The world will continue to use natural gas for several decades and this natural gas supply should come preferentially from Canada.

Several material opportunities for action have been identified that could potentially contribute to Canada resolving its LRNG-specific competitive issues. These include fiscal measures, market access, technology and innovation, and branding. These are detailed for LRNG in the following sections of the report.

Industry, the federal government and provincial governments have at their disposal certain tools that can improve competitiveness. These tools include business-led solutions, government policy actions and public/private partnerships leading to short, medium and long-term outcomes. Collaboration between the public and private sectors should improve Canada’s overall competitiveness, growing the sector and lowering global GHG emissions.

Integral to achieving this global leadership opportunity is the requirement to regain investor confidence by addressing competitiveness gaps, easing market access constraints and improving the Canadian energy brand.

Market Access

Context

Canada has an opportunity to grow its natural gas production to meet increasing global energy demand, while at the same time contributing to global reductions in GHG emissions. However, changes in North American natural gas markets in recent years have resulted in significant challenges for Canadian natural gas producers. Canada is losing market share to U.S. producers that are growing supply while faced with less stringent environmental regulations. With the growth of the Marcellus basin, U.S. production has captured significant market share in the Northeast U.S. and Eastern Canada historically served by western Canadian gas supply. Approximately 2.4 billion cubic feet per day of natural gas is currently being imported into Eastern Canada. In addition, U.S. supply recently began to capture increased share in global natural gas markets via LNG exports, and continues rapid growth of new LNG infrastructure and export terminals.

The Canadian natural gas industry also faces a significant transportation cost disadvantage for new-build pipelines accessing U.S. markets due to the longer distance from market. U.S. natural gas prices are expected to remain at low levels, as a result of ongoing surplus supply availability relative to demand. At these price levels the tolls associated with building new capacity for Canadian supply to access the U.S. market erode the available margin to the point where new pipelines cannot be justified.

As shown in the map on the following page, the U.S. does not require Canadian natural gas beyond that which Canada is already supplying to U.S. markets on existing infrastructure. U.S. natural gas growth is continuing to displace Canadian natural gas, with the result that Canadian natural gas is now challenged to retain its current markets and is competing for much more limited growth, largely in Western Canada.
In summary, Canadian supply growth is limited by pipeline infrastructure bottlenecks and a lack of LNG export infrastructure, resulting in severely discounted western Canadian natural gas prices. The limited prospect for growth has also dramatically impaired investor confidence, reduced government revenues, and harmed the bottom line for producers exposed to pricing at AECO. Industry is of the view that uncertainty in the regulatory framework (particularly as it relates to timelines, scope and participation), is also discouraging investment in energy developments in Canada.

These factors have had profound negative implications for Canadian natural gas producers, and that near-term action to improve competitiveness and enable market growth is required.

AN ESSENTIAL FIRST STEP IS TO EXPEDITE ACTION TO ENABLE COMPETITIVE ACCESS TO MARKETS IN THE U.S. AND IN EASTERN CANADA THROUGH USE OF EXISTING INFRASTRUCTURE WHEREVER POSSIBLE.
Opportunity Assessments

1. Enable Competitive Pipeline Access to North American Markets

An essential first step is to expedite action to enable competitive access to markets in the U.S. and in Eastern Canada through use of existing infrastructure wherever possible.

**OBSERVATIONS**

Canada has an opportunity to retain market share in its traditional U.S. and Canadian markets (California, the Midwest, and Eastern Canada) and to capture growth in those markets. Canadian pipelines serving these markets are depreciated, making gas delivery costs low, and making Canadian natural gas competitive with U.S. gas. De-bottlenecking of the Nova Gas Transmission Limited (NGTL) system would allow Canadian producers to compete head-to-head with U.S. supply for market growth in these traditional market areas served with existing pipeline infrastructure. NGTL de-bottlenecking can also assist in accelerating growth in local markets, by providing incremental natural gas supply needed for conversion of electrical generation to natural gas from coal, and by creating value-added products such as fertilizer, petrochemicals and olefins that use natural gas feedstock.\(^\text{15}\)

Measures need to be implemented to reduce rates on Canadian pipelines serving markets where consumers have a diversity of supply alternatives, in order to ensure Canadian natural gas remains competitive in those markets.

**OPPORTUNITY AREA**

Competitive pressure from U.S. natural gas supply is immediate and pressing. Industry has identified the following short-term levers that could improve the competitive position of Canadian natural gas versus U.S. supply for natural gas markets traditionally supplied by Canada:

- Expedite regulatory review process for pipeline access to markets:
  - Reduce federal regulatory timelines for pipeline access to markets, initially with a view to expediting the regulatory review of proposals to de-bottleneck the NGTL system and access eastern Canadian markets.

- Implement measures to reduce transportation costs on the Canadian pipelines that serve markets also supplied by U.S. natural gas:
  - Examine Canadian pipeline charges under federal or provincial oversight.
  - Consider changes to pipeline abandonment surcharges, such as deferral of those charges or alternate mechanisms to offset the surcharges for Canadian supply that competes for markets also served by U.S. supply.

- Assess potential alternative mechanisms that offer potential to provide more innovative funding for development of new infrastructure for value added light tight oil and natural gas downstream development such as pipelines, LNG facilities, straddle plants or similar infrastructure.

2. Accelerate Natural Gas Market Growth in Canada

Beyond the near-term growth opportunities for Canadian natural gas facilitated by the de-bottlenecking the NGTL system and enhancing access to other markets where Canadian natural gas has potential to be competitive against alternative supply sources, a more concerted effort needs to be made to grow the natural gas market in Canada.

**OBSERVATIONS**

There are many opportunities for natural gas growth in Canada.

These include increased use of natural gas for power generation (utilizing technologies that are less GHG emissions intensive), as an input for creation of value-added products, and as a fuel source for steam generation in the oil sands if competitiveness issues impeding growth of the oil sands are addressed. In particular, petrochemicals represent a growth opportunity on a global scale. Canada has the potential to use its lower-carbon energy and natural gas supply to produce lower-carbon petrochemical products (including plastics) that are competitive in global markets. »

\(^{15}\) 2018 report to the Minister from Alberta’s Economic Diversification Advisory Committee – “Diversification, Not Decline: Adapting to the new energy reality”
OPPORTUNITY AREA

Opportunities exist to grow the domestic natural gas market in the areas outlined below:

• Transition from coal-fired electricity generation to natural gas-fired generation (potential in Alberta and other provinces):
  - Reduce federal regulatory timelines for pipeline access to markets, with a view to increasing supply certainty for new natural gas-fired power generation projects.
  - Promote climate change policy predictability to reduce the investment risk associated with possible future changes to federal and provincial government policy.
  - Encourage least-cost electricity generation alternatives, within broader climate policy frameworks.

• Foster development of Canadian petrochemical, fertilizer, methanol, and olefins projects using natural gas and/or natural gas liquids as feedstock:
  - Examine the use of regulatory changes, such as front-end environmental assessment and community engagement by local governments, to encourage the development of petrochemical and similar infrastructure (stand-alone or clusters).
  - Examine the use of fiscal measures, such as tax or royalty incentives, to encourage the development of petrochemical and similar infrastructure.

• Consider strategies to allow higher Canadian exports of condensate and other light hydrocarbons:
  - Review existing legislated standard applied to potential condensate exports from the West Coast.

3. Develop LNG Export Infrastructure on Canada’s West Coast

The JWG decided that the separate “British Columbia Canada LNG Competitiveness Review” table would be the primary vehicle by which to address issues related to LNG. For that reason, this report includes only a high-level overview of the LNG opportunity.

Significant medium-term growth potential for Canadian natural gas producers is largely dependent on the development of LNG export infrastructure on Canada’s West Coast.

OBSERVATIONS

As shown in the chart below, there is an opportunity for Canadian natural gas to capture the next cycle of LNG demand, by ensuring the development of an LNG industry with multiple liquefaction plants/export terminals. Canadian LNG can be cost- and carbon-competitive globally, and that now is the time to build new LNG infrastructure to access global markets.

GLOBAL LNG DEMAND

Source: Wood Mackenzie 4Q LNG tool includes only LNG supply existing or under construction.
In that context, LNG development is critically important for the Canadian natural gas industry. It should be emphasized that one LNG facility is not enough to de-bottleneck the supply potential in Western Canada. As a further consideration, LNG uses dry gas (methane). Canadian natural gas production commonly has large associated condensate and natural gas liquid (NGL) content, and such liquids would therefore be available to support growth of fertilizer, petrochemicals, methanol, olefins and other industries that use condensate and NGLs as feedstock. Condensate volume growth could displace U.S. imports currently used for oil sands diluent. Additionally, LNG can be used domestically for power generation in remote communities and mining operations.

**OPPORTUNITY AREA**

Industry is of the view that the federal government should strongly support the development of an LNG industry on Canada's West Coast, with the development of multiple plants over time. More specifically, potential levers to address cost competitiveness opportunities include accelerated capital deductibility for tax purposes across the LNG value chain (plants, pipelines, upstream), EITE protection, infrastructure investment including electrification, and/or other fiscal measures to assist in mitigating investor risk. Industry also understands that potential removal of import duties on fabricated industrial steel components for large and complex LNG modules is an issue that will be considered on a project-by-project basis and in the context of broader trade policy. Industry also acknowledges the challenges arising from the current dynamics around international trade, such as the U.S. imposition of tariffs on Canadian steel and aluminum.

The LNG opportunity also provides significant potential for Indigenous participation, jobs and business opportunities.

Global benchmarking of Canadian LNG project performance should be an important dimension of the path forward, particularly as it relates to comparative GHG emissions intensity.

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**Technology and Innovation**

**Context**

Innovation is fundamental to how companies in the LRNG sector do business. Producers are focused on this area and there are well-established relationships with Canada's technology sector. But to be cost- and carbon-competitive going forward, the pace of innovation needs to accelerate. Driven by market pressures and increasing environmental stringency, companies must innovate to maintain their competitive position and enable ongoing investment. Maximizing the return on LRNG investment through operational innovation and driving cost and productivity efficiencies all go hand-in-hand with improved environmental performance.

Boosting innovation correlates with economic, social and environmental benefits, including a healthy technology sector, and benefits extend to diversification and synergies with other industries (i.e., transfer of technologies outside of oil and natural gas).

The synergy between LRNG and emissions-reduction technology is important to the Canadian economy. Significant investment made so far in applying such technologies to LRNG operations have demonstrated the benefits in terms of improved environmental and safety outcomes, including reduced emissions intensity, improved well integrity, new well drilling techniques to reduce surface/ecological footprint, lower-emissions power sources, and advancements in water usage.

Despite successes to date and the associated benefits realized through a commitment to innovation, like other industry sectors in Canada the LRNG industry must do better when it comes to innovation. LRNG needs to expand beyond the conventional aspects of innovation — traditionally defined as new technologies and R&D — to accelerate innovation from all possible avenues, including innovation arising from operations in the field and more extensively collaborating both within and beyond the industry. Another important factor to encourage competition and efficient innovation is regulatory and fiscal regimes that incent market-driven innovation. A shift from prescriptive to an outcomes-based approach to regulation would enhance competitiveness by providing industry greater flexibility in determining the most cost-effective means by which to realize the intended regulatory outcome.
Industry has identified several challenges currently impeding investment in innovation and technology in the LRNG sector:

- In the current low commodity price environment and more risk-averse business investment climate, existing innovation incentive programs are not well aligned with the risk profile of LRNG innovation:
  - In today’s ultra-competitive, low commodity price environment, more than ever investment in innovation needs to be supported by a strong business case. There is a need to help de-risk field-based innovation investment for companies. The SR&ED program would be more effective if field-based innovation was explicitly included in the program scope (see Business Investment Climate section of this report for a more detailed discussion on SR&ED opportunities).
- The LRNG innovation ecosystem is lacking in capacity and coordinated action on pure and applied R&D:
  - Collaboration in LRNG on pure and applied R&D is lagging, compared to the Canadian oil sands sector and to LRNG in the U.S. Addressing this gap could play a role in boosting innovation, which includes leveraging existing organizational structures in this space (such as the Petroleum Technology Alliance Canada and the Natural Gas Innovation Fund).
- Upstream electrification is challenged by both economic and infrastructure barriers:
  - This important emissions reduction opportunity for LRNG development will remain economically challenged in a persistent low natural gas price environment, yet the GHG emissions gains from using sources of lower-emissions electricity are potentially very significant. This opportunity cannot be realized without a thoughtful, coordinated and inclusive approach to growing electricity infrastructure and enabling site electrification.
- Infrastructure challenges limit operational innovation:
  - Moving to larger manufacturing-style operations is an important enabler of operational innovation, while providing environmental advantages. However, the large-scale infrastructure needed to achieve economies of scale often faces regulatory and/or fiscal hurdles and may be lacking in co-ordination between industry and government.

Opportunity Assessments

Several potential levers to address these challenges were considered to enhance LRNG innovation.

1. Increasing Collaboration in Pure and Applied R&D

In the LRNG sector, where current market dynamics are putting pressure on private sector R&D budgets, the innovation gap is becoming more pronounced. LRNG faces challenges at the demonstration and commercialization phases of the innovation process, where technology and financial risks limit the uptake of innovation.

To overcome this gap, a collaborative approach that couples private and public partners with necessary funding and expertise could help de-risk investments in innovation, particularly in the commercialization phase. Ideally, the collaboration model should include technological experts across the sector, policy makers, innovators, and private sector decision-makers and funders, including partners outside the sector. Models that promote broad collaboration between industry, academia, and government can help lend credibility to innovations, which can help de-risk the commercialization of new technologies. These innovation models also have applicability outside the sector.

New approaches to methane emissions measurement, monitoring and reporting are an example of an opportunity to improve focus and collaboration.

This approach would deliver innovative and cost-effective solutions and could be enabled by an outcomes-based regulatory framework for methane.

OPPORTUNITY AREA

An industry-led task force should be established to consider best practice and to assess opportunities to support a new model for a collaborative approach towards LRNG-focused R&D, with consideration for development of an overarching innovation strategy (program design and intent), alternative structures and potential mechanisms to access government funding support.

2. Enabling Electrification of Upstream LRNG Development

One of the single largest opportunities to achieve a substantial reduction in upstream emission intensity, while supporting growth in LRNG, is through the electrification of new upstream natural gas facilities. Eliminating upstream combustion emissions via electrification, made possible by connecting to a lower-emissions electricity system, could reduce the upstream carbon intensity by approximately half.

As provided in the Summary of Modelling Results section of this report, it is estimated that, as a result of Canadian fugitive methane regulations and implementation of an aggressive upstream electrification program, there is the potential to have up to 50 per cent increase in natural gas growth with no increase, or a slight decrease, in upstream GHG emissions.
Upstream electrification therefore plays a key part in addressing emissions growth in the LRNG sector and can also help position Canada as a leader in supplying the least emissions-intensive LNG in the world.

The shift to electrification is not without its risks. Continuing to use natural gas-driven equipment offers predictable construction timelines, reliable in-service operations and is cost effective, particularly in the current and foreseeable future low natural gas price environment.

Understanding and addressing the following challenges related to upstream electrification will be critical to realize of the benefits from future upstream electrification:

• An extensive transmission infrastructure build-out is required to support electrification;
• Timelines required to develop transmission infrastructure must align with the build-out of LRNG processing infrastructure timelines, to ensure availability of reliable transmission capacity; and,
• As noted elsewhere in this report, the economic risk between electrification and alternative power sources needs to be addressed through an incentive system for electrification, which considers a broad range of potential incentive mechanisms to provide the necessary commercial incentive to pursue electrification versus other fuel supply alternatives.

One of the largest opportunities to substantially reduce upstream emission intensity is through electrification of new upstream natural gas facilities.

Opportunity Area

There are opportunities for industry and governments to consider how to build on the results of the Regional Electricity Cooperation and Strategic Infrastructure Initiative (RESCI) study and to examine the LRNG upstream oil and natural gas electrification opportunities in more detail, taking into consideration the need to address both economic risks, infrastructure constraints and possible funding mechanisms.
3. Infrastructure Opportunities to Enable Operational Innovation

Operational innovation, including how companies progress novel approaches to development, is important to competitiveness. Providing the necessary supporting infrastructure is important to operational innovation and also provides environmental advantages.

The transition to multi-well pads and longer lateral wells which has provided a lower surface footprint, requires innovative infrastructure approaches to roads, power, water, and movement of materials — areas where governments play key roles.

Other areas of innovation, such as support for efficient supply of hydraulic fracturing sand and support for major in field road infrastructure that is currently paid for by industry (unique to Canada due to the remoteness of our operations – U.S. competitors typically do not incur this cost) can also help address competitiveness challenges. They potentially deliver total cost efficiencies in the range of 1 to 5 per cent reduction in capital investment per well. The results of modelling work conducted for this initiative found a 2 per cent cost efficiency would materially contribute to improving Canadian LRNG competitiveness.

4. Domestic Fracturing Sand

Currently the majority of fracturing sand for western Canadian operations is sourced from the U.S. (Minnesota and Wisconsin), which relies heavily on rail transport. Supporting the moving this supply chain to Canadian fracturing sand sources through strategic infrastructure investments such as road or rail improvements could realize many benefits, including well cost reductions, increased local investment and associated economic benefits, de-bottlenecking rail systems benefitting many other commodities, and improved environmental performance through reduced life cycle emissions.

In addition to targeted infrastructure investments, improved regulatory timelines and processes would facilitate development of local sand supply, which is currently impacted by the need for multiple permits at the provincial level often with long and uncertain timelines.

OPPORTUNITY AREA

Industry and governments should work together to assess regulatory streamlining opportunities and strategic infrastructure investments, both of which could serve to facilitate (i) domestic fracturing sand development and (ii) significant in-field road infrastructure required for development (which is generally not borne by U.S. competitors).

Summary of Modelling Results

Industry undertook analysis to quantitatively understand the range of impacts (and the resultant competitiveness gap) that could result from recent U.S. and Canadian policy actions influencing industry competitiveness. Three phases of analysis were performed:

1. Play-Level Competitiveness Gap Analysis: Play-level economic modelling on representative LRNG plays to quantify sector-level competitiveness impacts resulting from policy/fiscal changes taking place in the U.S. and Canada in the near term, and to test the effectiveness of proposed levers in addressing the resultant competitiveness gap.

2. Sector-Level Response Analysis: Assessment of sector-level production/investment response in both the Business As Usual (BAU) scenario where no specific government action is taken, and the Growth scenarios, whereby government actions are taken (via the policy levers identified in the first phase of this study) to address the competitiveness gap.

3. Canadian Economy-Level Impacts Analysis: Building on the sector-level responses identified in the second phase of modelling activity, General Equilibrium Modeling (GEM) was used to predict the impact on the Canadian economy for the alternative scenarios.

FROM A PAYOUT PERSPECTIVE, THE COMPETITIVENESS GAP RESULTS IN TYPICAL CANADIAN OIL AND NATURAL GAS INVESTMENTS TAKING AN EXTRA ONE TO TWO YEARS TO ACHIEVE PAYOUT OF THE INITIAL CAPITAL INVESTMENT.

The modelling approach was premised upon basic resource play fundamentals and investment decision principles. For example, the assumption of equivalent returns (as a starting point) for typical North American oil and natural gas investments is consistent with the free flow of capital and with studies that demonstrate the comparability of U.S. and Canadian oil and natural gas investments. With respect to the scope of modelling, several limitations were necessarily defined, notably the exclusion of risk-related factors such as regulatory uncertainty and associated delays.
Key economic metrics typically used by industry in making investment decisions were used to assess economic competitiveness of various investment opportunities; Internal rate of return (IRR) was selected as a key indicator of overall profitability for the oil and natural gas sector. However, payout was considered as an increasingly important metric in light of the current realities of market volatility, regulatory uncertainty, and competitiveness relative to other jurisdictions. Investors are increasingly focused on shorter cycle investment opportunities and the timeframe necessary to recover their upfront capital investment. This is essentially a strategy to mitigate uncertainty and risk.

Some uncertainty remains associated with Canadian climate policy including:
- Policy defining the extent of EITE coverage in different provinces;
- Clean Fuel Standard stringency / timing of implementation; and
- A range of incremental cost of Canadian methane regulations versus competing U.S. jurisdictions, including difference whether considering existing or new production facilities.

Tornado chart analysis and modeling of EITE coverage required over time (in recognition of both (i) recent ECCC policy direction that CFS will likely be phased in over the period of 2023 to 2030 and (ii) that Canadian incremental methane costs are anticipated to decrease slightly as U.S. methane regulations on new equipment take effect in the early part of the next decade) shows the level of EITE protection required for competitiveness purposes has limited sensitivity to these climate policy cost uncertainties.

As provided in Appendix E, sensitivity analysis demonstrates that only slightly less EITE coverage would be required initially to address the competitiveness gap, however analysis confirms upon full implementation of all climate policies the EITE coverage to maintain competitiveness is ~80%.

**Key findings of the impact assessment for LRNG include:**

1. Modelling of representative play economics demonstrated a measurable competitiveness gap exists between Canadian LRNG investments and similar opportunities in the U.S., as a result of recent U.S. tax regime changes implemented plus the aggregate impact of incremental regulatory cost of existing and pending climate policies in Canada. The competitiveness gap between typical U.S. and Canadian LRNG investments (assuming 50 per cent EITE protection on carbon price) is significant at approximately 7 per cent rate of return (16 per cent versus 9 per cent IRR). Considered alternatively, U.S. investments provide roughly double the rates of return for a typical upstream oil and natural gas investment.

2. Testing the suite of policy levers identified by the JWG sub-committees demonstrates that policy action can address the competitiveness gap, thereby influencing investment decisions for Canadian LRNG opportunities. Economic modelling shows that implementing the following levers would collectively address the competitiveness gap:
- Implementing immediate capital deductibility;
- Targeted infrastructure enabling lowering of upstream capital costs; and
- Providing approximately 80 per cent EITE coverage protection on the aggregate cost of Canadian climate policy.

Sensitivity analysis (considering in part the phasing in of Clean Fuel Standard policies per recent ECCC policy direction) demonstrates that only slightly less EITE coverage would be required initially to address the competitiveness gap, however analysis confirms upon full implementation of all climate policies the EITE coverage to maintain competitiveness is estimated to be ~80 per cent.

3. Government policy action can drive significant LRNG sector activity and spending. Compared to the BAU scenario, it is estimated that positive government action to address the competitiveness gap (Growth scenario) will result in an incremental $14 billion per year of annual spending ($12 billion per year upstream LRNG and LTO, $2 billion per year downstream LNG), delivering 50 per cent growth in Canadian natural gas production by 2026.

**Modelling Results for Competitiveness Gap Analysis: TYPICAL PLAY CORPORATE ECONOMICS (IRR VIEW) WATERFALL**

- **Base**
- **Competitiveness Gap**
- **Remaining Gap**
- **Y1 Deductibility**
- **2% CAPEX Decrease**
- **US Tax Uplift**
- **Remaining Gap**
- **Residual Climate Impact**
- **EITE Protection**
- **Base**

From a payout perspective, the competitiveness gap results in typical Canadian oil and natural gas investments taking an extra one to two years to achieve payout of the initial capital investment.
4. The incremental investment attributable to policy action in the Growth scenario provides material economic benefits, demonstrating importance of oil and natural gas competitiveness to the Canadian economy. General Equilibrium Modeling (GEM) shows the incremental $14 billion per year of annual spending in LRNG / LNG / LTO sustains an increase in Canada’s real GDP of $37 billion on average by 2030. Furthermore, the GEM shows the incremental LRNG / LNG / LTO activity provides significant growth of inclusive employment opportunities for Canadians, sustaining the addition of ongoing 80,000 jobs in oil and natural gas, construction and service sectors, and government revenues are expected to increase by $7.5 billion per year on average by 2030 (total from both incremental oil sands and LRNG / LNG / LTO – the relative contribution has not been quantified at this time), with $1.6 billion per year of that amount coming from LRNG royalties.

5. With the implementation of cost-competitive climate action on methane, and measures to support a large-scale upstream electrification program to reduce combustion emissions, modelling suggests the Growth scenario natural gas production increases of 50 per cent could be achieved while keeping GHG emissions essentially flat. »
Branding

Context

Canada has a long and proud history in development of its natural resources, including natural gas and light hydrocarbons. In many respects Canada continues to demonstrate leadership in environmental and social performance.

However, Canada’s energy brand has eroded over the past several years. This issue must be addressed more directly and more effectively by both industry and governments if investment is to be attracted to the Canadian natural gas sector and Canadian natural gas supply and services are to be internationally competitive.

A brand cannot be proclaimed, but rather needs to be established through engagement, commitments and performance.

As part of a broader effort to enhance the reputation of Canada’s oil and gas industry, the Canadian natural gas sector is well positioned to reframe the conversation about natural gas, to deliver on performance improvement and to enhance the overall reputation of the industry.

This process must start by acknowledging the challenges associated with climate change and demonstrating how Canadian natural gas can be part of the domestic and global solution. Canada’s world-class natural gas, natural gas liquids and tight oil resources can support emissions reductions by displacing higher carbon sources of energy both domestically and globally. Domestically, Canadian governments at both the federal and provincial levels have implemented or are in the process of implementing policies that will lead to GHG reductions (e.g., Pan-Canadian Framework on Clean Growth and Climate Change, Alberta Climate Leadership Plan).

Canada’s natural gas industry can demonstrate lower GHG intensity and higher environmental standards than the U.S. as our closest competitor. Additional potential steps, such as increasing electrification and linking natural gas extraction/processing with the clean tech sector, will further improve this environmental performance and put Canada in a position to be a global leader. Canada has the opportunity to become the lowest GHG emissions intensity provider of natural gas, natural gas liquids and tight oil resources in the world, displacing higher GHG emissions intensity fossil fuels and leading to a global reduction in GHG emissions.

The displacement of higher carbon fuels would also give Canada an opportunity to actively pursue an international offset credit framework. As per the international co-operation mechanisms enshrined in Article 6 of the Paris Agreement, parties can co-operate with one another when implementing national emission reductions targets. Such a credit framework would also help address Canada’s ability to reconcile growth in the sector with its domestic emissions reduction goals. In fact, industry is of the view that it could be key to meeting Canada’s very ambitious climate targets.

To take advantage of this opportunity Canada needs to implement several of the innovations described above, including taking advantage of electrifying upstream oil and natural gas as well as LNG infrastructure, resulting in a significant reduction of life-cycle emissions. Pursuing these opportunities would not only demonstrate that Canada is committed to providing lower-carbon energy products to meet the world’s growing demand for energy, it can also help foster increased environmental and cultural acceptance for LRNG development among Canadians by demonstrating that Canada’s natural gas sector is actively taking steps to address its emission profile.

However, it’s not all about carbon emissions. There are many other dimensions of environmental and social performance that are extremely important. And it’s about economic opportunities and jobs, without which it is difficult to sustain public support for environmental and social leadership actions.

Beyond the domestic and international emission benefits, industry believes the future of Canada’s LRNG industry provides significant economic prospects for Canadians and for Indigenous communities. It leverages the industry’s strong track record as a responsible producer, addresses inclusiveness employment issues, provides a platform for value-added industries, supports Canadian innovation, and contributes significantly to the overall economy and to government revenues. In addition to the climate dimension of reputation, these areas are a key element of the path to enhancing the Canadian natural gas sector’s brand.

Importantly, these outcomes are dependent on action by industry and governments to address competitiveness gaps and attract investment to the sector. However, these commitments and actions alone will not be enough to address the issues associated with Canada’s energy brand. We will also need to engage and communicate with key audiences in a manner that directly relates to their interests, starting with engaging Canadians with a positive message related to their everyday lives.

\[
\text{CANADA HAS THE OPPORTUNITY TO BECOME THE LOWEST GHG EMISSIONS INTENSITY PROVIDER OF NATURAL GAS, NATURAL GAS LIQUIDS AND TIGHT OIL RESOURCES IN THE WORLD.}
\]

Governments, industry and other interests should all play a role in broadly communicating the role for LRNG in Canada’s energy future and in shifting to a low carbon economy. This communication would contribute to a broader national consensus that growth of the LRNG sector is aligned with Canada’s broader economic, environmental and social objectives.

\[\text{Proposed Actions to Address the Competitiveness of Canada's Upstream Oil and Natural Gas Sector}\]
This should be a broad-based effort with aligned messaging, and playing offense rather than defense in engaging and communicating regarding the opportunities for Canadian natural gas. Lessons can be learned from the way some other jurisdictions and certain companies have made progress on positioning natural gas as a key part of the transition to a low carbon energy system/economy.

Governments and industry working together on commitments, actions and an improved narrative could over time earn a more positive brand for Canada’s energy sector.

**OPPORTUNITY AREA**

As a starting point, it will be important for industry to take the initial steps in developing the stories and core messaging that can be refined and used by industry and governments at their discretion, adjusted to reflect their respective roles and target audiences. This would need to be accompanied by a robust integrated communications and engagement plan.

To leverage the positive energy branding opportunity for natural gas, the Canadian government should integrate the natural gas messaging into its broader vision for the future of Canada’s energy sector.

Governments can use a number of platforms – including multilateral forums, bilateral forums, other competitiveness initiatives, the follow-up on Generation Energy and Resources for the Future, and the EMMC dialogue – to advance this messaging.

**Conclusions**

The world’s demand for affordable, safe and reliable energy is expected to continue to grow significantly over the next two to three decades. The recent IEA *World Energy Outlook* projects that in 2040 oil and natural gas will continue to supply more than half of the global energy demand. At the same time, there is increasing focus on global climate change and the importance of reducing carbon emissions from the global energy system. Canada has committed to work toward significant reductions in GHG emissions, as evidenced by both the 2015 *Paris Climate Agreement* the Pan-Canadian Framework on Clean Growth and Climate in late 2016.

This is not an either/or proposition. Canada has large natural gas resources that can continue to play an important role in meeting Canadian and global energy demand, increasing economic prosperity and improving quality of life, while doing so in a manner that contributes to reducing global carbon emissions and energy poverty and also positions Canada among the global leaders in environmental and social performance.

Canada has the opportunity to play a leadership role in the global transition to a lower-carbon energy system/economy, with the vision being: Canada is a preferred supplier of cost- and carbon-competitive natural gas and light hydrocarbons to domestic and global markets, produced with leading environmental and social performance standards.

However, the competitiveness of Canada’s oil and natural gas sector is increasingly challenged, in part due to broader market conditions, in part due to fiscal policy changes in the U.S., and in part due to policy and regulatory decisions by Canadian governments. Canada is at a critical, time-sensitive juncture in terms of decisions on key oil and natural gas opportunities, and in forging a broader consensus on the future vision for the oil and natural gas industry. Ensuring that Canada remains competitive would re-establish the investor confidence required to attract the capital to sustainably grow the Canadian industry and economy.

Potential actions to address this issue are within the purview of both industry and governments, working collaboratively with Indigenous peoples and stakeholders.

For its part industry continues to reduce its cost structure and address GHG emissions intensity across all areas of the business by seeking efficiencies, and by applying new technology and innovative systems and processes. However, industry is of the view that these actions alone cannot overcome the competitiveness challenge, and therefore actions by governments are also urgently required.

Material potential opportunity areas to address competitiveness have been identified in the following broad areas:

- Business Investment Climate;
- Inclusiveness;
- Market Access;
- Technology and Innovation; and,
- Branding.

**CANADA HAS LARGE NATURAL GAS RESOURCES THAT CAN CONTINUE TO PLAY AN IMPORTANT ROLE IN MEETING CANADIAN AND GLOBAL ENERGY DEMAND, INCREASING ECONOMIC PROSPERITY AND IMPROVING QUALITY OF LIFE, WHILE DOING SO IN A MANNER THAT CONTRIBUTES TO REDUCING GLOBAL CARBON EMISSIONS AND ENERGY POVERTY AND ALSO POSITIONS CANADA AMONG THE GLOBAL LEADERS IN ENVIRONMENTAL AND SOCIAL PERFORMANCE**
More specifically, based on the work conducted over the past several months, including the results of the modelling detailed in this report, the following key potential opportunities for action were identified to improve competitiveness and close the gap vis-à-vis the U.S.:

- Allowing immediate deductibility of capital costs for tax purposes in the year in which they occur, to be applied broadly across the economy while providing the collateral benefit of enhancing the ease of tax compliance and administration, and jointly examining innovative financing approaches for small to medium sized firms in the upstream sector;
- Increasing the level of protection to approximately 80 per cent coverage of the aggregate compliance cost for EITE industries, in order to address the competitiveness gap with the U.S. and to avoid carbon leakage;
- Proceeding with the government’s commitment in the 2017 budget to review the Scientific Research and Experimental Development (SR&ED) tax credit program, with a view to making it more effective through risk-sharing, inclusion of operational innovation within scope, providing greater certainty with respect to the application process, simplifying the audit process and providing greater support for projects throughout the innovation life cycle;
- Continuing to take a leadership role in framing the opportunity for international recognition of Canada’s progress in reducing global GHG emissions via its natural gas exports, and in seeking international credits through trade agreements under Article 6 of the Paris Agreement;
- Enhancing the competitiveness of Canadian natural gas by taking action to reduce pipeline rates and increasing capacity of Canadian natural gas pipelines serving markets where consumers have a diversity of supply alternatives, including accelerating the regulatory review process for NGTL de-bottlenecking, in order to ensure Canadian natural gas remains competitive in those markets;
- Visibly supporting and taking action to advance the development of an LNG industry on Canada’s West Coast, with development of multiple LNG plants over time to provide access to global natural gas markets – the market window will otherwise continue to be seized by LNG projects in other jurisdictions;

- Enabling accelerated collaborative technology and innovation in the sector, particularly as it relates to commercializing electrification of upstream LRNG and downstream LNG facilities, and other technologies with potential to reduce costs and GHG emissions (industry recognizes that increasing EITE protection and incentivizing electrification in some manner may appear to be contradictory potential actions, but this is indicative of the challenges that arise in endeavoring to concurrently address both cost competitiveness and carbon competitiveness as measured by GHG emissions intensity); and,
- Enhancing the reputation/brand of the Canadian natural gas sector by creating a refreshed narrative for the sector — founded on balanced policy, improvement in the industry’s environmental and social performance, Canada’s role in reducing global GHG emissions and the sector’s contribution to economic prosperity in Canada and globally – and communicating and engaging more effectively with Canadian and global audiences using this new narrative.

In addition, other opportunities for action, including an inclusiveness assessment and targeted infrastructure support (road, rail) to lower overall costs in the sector, have been identified.

In summary, Canada’s LRNG sector presents a significant opportunity for inclusive growth aligned with Canada’s economic, environmental and social objectives. Opportunities for action have been identified to address cost competitiveness challenges, to mitigate current price discounts for our oil and natural gas production, to accelerate innovation and to improve the Canadian energy brand. These actions would in turn restore investor confidence, attract investment and provide the platform for a broader national consensus on the future of the Canadian oil and natural gas industry, all of which would lead to significant growth of the sector for broader benefit to Canadians.
Context

The world’s population is expected to grow by nearly two billion people to reach about 9.2 billion by 2040, while the global middle class is expected to almost double in the same period. A larger population, combined with global gross domestic product (GDP) growth, means countries will be more urbanized and industrialized, and will consume substantially more energy than today. Industry, academic, and government institutions have generally projected energy demand to rise about 30 per cent by 2040 from today’s level. As the International Energy Agency (IEA) indicates in its World Energy Outlook 2017, this is the equivalent to adding another China or India to current consumption.

As the world’s population continues to grow, total energy demand will also increase. Oil will remain essential due to its position in the transportation sector, and as an input in the industrial, chemical and manufacturing sectors. In 2016, the world consumed about 94 million barrels per day (b/d) – or about 32 per cent of total energy demand from all sources. By 2040, the IEA estimates total world oil consumption is projected to be about 105 million b/d, a 12 per cent increase.

Canada’s Resource

Canada has the third-largest oil reserves in the world — 97 per cent of this is in the oil sands. Canada’s long-term, stable supply of energy is produced through leading sustainability practices, including advances in reducing GHG emissions intensity and the environmental footprint of production. In 2014, $6.5 billion was spent by the oil and natural gas industry on environmental protection measures – more than 55 per cent of the total spend by all Canadian businesses. The oil sands account for 9.8 per cent of Canada’s GHG emissions or about 0.15 per cent of global GHG emissions.

Commercialization of technological advancements continues to reduce operating costs, capital costs and emissions intensity, while growing production and realizing the value of new oil sands development. Since 2012, Canada’s Oil Sands Innovation Alliance (COSIA) members alone have invested more than $1.4 billion to develop 981 distinct technologies that reduce impacts to air, water, land and wildlife.
In addition, Canada’s oil sands create jobs and prosperity. The sector contributes significantly to Canada’s GDP and federal/provincial revenues: in 2016, the oil sands contributed 2.58 per cent to Canada’s GDP and employed 228,000 Canadians.\(^{24}\) Between 2017 and 2027, the sector will pay an estimated $256 billion in provincial and federal taxes.\(^{25}\) Rural and Indigenous communities across Canada rely on the oil sands for business contracting, providing sustainable economic development and jobs in their communities. Oil sands companies purchased $3.33 billion from Indigenous-owned businesses in 2015-16, contributed $48.6 million to communities in support of education and cultural events, and an additional $40.8 million in 2015-16 on consultation capacity to ensure that Indigenous communities could participate actively in the consultation process.\(^{26}\) Further, Indigenous equity participation in energy projects is commonplace.\(^{27}\)

These socioeconomic benefits that have increased the quality of life for Canadians stem from investment in Canada’s resources. Competitiveness issues and a lack of market access could compromise the oil sands’ ability to generate incremental benefits to communities.

**Challenges**

Different regulatory requirements (and in some cases, a lack of environmental regulations and carbon taxes) in other oil-producing regions, and recent U.S. tax reforms, make investment in Canada less attractive. Yet the rising demand for oil will ultimately be met, if not from Canada then from other producers.

Canada has the opportunity to limit carbon leakage, but the cumulative effect of policies and regulations are rapidly diminishing this opportunity, impacting full value chain opportunities from upstream development projects to partial upgrading and coker expansions. Other headwinds include pipeline capacity, heavy discounts on Canadian crudes, lengthened regulatory hearings, increased costs, disruption of construction, legal risks, and cancellations of projects, these challenges investment in new and existing projects. Final investment decisions for long-cycle investment oil projects are moving to the United States, Brazil, Nigeria and other areas of the world with limited environmental regulation.\(^{28}\)

**COMPETITIVENESS ISSUES AND A LACK OF MARKET ACCESS COULD COMPROMISE THE OIL SANDS’ ABILITY TO GENERATE INCREMENTAL BENEFITS TO COMMUNITIES.**

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\(^{24}\) CAPP calculations using results presented in the January 2018 Impacts of Oil and Gas Industry Expenditures in 2015 on the Canadian Economy report by Prism Economics and Analysis.

\(^{25}\) Economic Impacts of Canadian Oil and Gas Supply in Canada and the US. Study No. 166. CERI. 2017.

\(^{26}\) CAPP Indigenous Engagement Survey, 2017

\(^{27}\) Indian Resource Council

Market Access

Context

At present, Canada’s four million b/d oil pipeline network is operating at near maximum capacity and will continue to see increased constraints by 2030 when Canadian oil supply is expected to grow from 4.2 million b/d to 5.6 million b/d.\textsuperscript{29} Canada can leverage our leadership in environmental stewardship and responsible energy production to help address growing global carbon emissions. But this can only occur if Canadian crude has access to global markets.

Near Term Pipeline Constraints

Currently, Canadian oil sales are mainly restricted to markets in Canada and the U.S. Due to market access constraints, Canadian oil is often discounted and sold at prices much less than the prices received globally for crudes of similar quality. Canada’s limited oil pipeline takeaway capacity results in heavy discounts on Canadian crudes and challenges investment in new and existing projects. Current pipeline constraints will cost oil producers $10.8 to $15.6 billion in annual revenue\textsuperscript{30} depending on whether rail capacity can fill the transportation gap.\textsuperscript{31}

In addition, Canada continues to import 600,000 b/d to Ontario, Quebec, and Atlantic Canada from the U.S., Africa, and the Middle East.

While rail may be a partial solution to the market access problem, it is viewed by producers as less reliable and costlier compared with pipeline transportation, not to mention that rail also has potential heightened safety and environmental risks.

Canada urgently needs to develop facilities and infrastructure to get our resources to emerging global markets before other suppliers capture these markets and help Canada obtain higher value for its resources.

If Canadian production is constrained due to the cumulative effects of regulatory delay and lack of market access, global energy demand will simply be met from other jurisdictions that have less stringent to no environmental policies and higher GHG intensity crudes. This would effectively be a wealth transfer to other countries with poorer environmental standards, and also means Canada’s current production, when sold in the U.S., obtains prices at a discount to global markets.

OPPORTUNITY AREA

Presently, three pipelines have received regulatory approval from the Canadian government, including Enbridge’s Line 3 replacement, the Trans Mountain Expansion (TMX) pipeline, and TransCanada’s Keystone XL (KXL). Despite approvals for all three projects – each granted after rigorous regulatory reviews – these projects continue to face delays.

The energy industry is encouraged by the federal government’s May 2018 announcement in support of TMX, a project critical to ensuring Canadian crudes are able to get full market prices and to Canada’s ability to continue attracting investment. It is important to continue to advance efforts to expand market access for Canadian heavy oil through support and endorsement of approved pipelines and expansion projects (including TMX, KXL and Enbridge Line 3).

Regulatory Delay

Industry believes that the regulatory environment in Canada has contributed to a worsening competitive position vis-à-vis the U.S. New regulatory costs, uncertainties, inefficiencies and delays have damaged Canadian project economics and investment. Regulatory decisions can take too long, are costly, and even post-approval are subject to other risks. There is uncertainty on what is required to get project approvals, as parameters can change during the review process.

\textsuperscript{29} CAPP, 2018. Crude Oil Forecast, Markets and Transportation 2018.
\textsuperscript{30} "Pipeline Approval Delays: The Cost of Inaction", Scotiabank, 2018
The development of energy resources is both a technical and financial challenge. Technical challenges include mapping the reservoirs, reservoir quality, oil and water treatment, and steam generation. Financial risks include raising capital through equity and debt offerings, managing cash flow volatility, and ensuring investors have the level of confidence required to invest. As operators manage their businesses, they seek to minimize risk to shareholders, to the environment and other stakeholders while aggressively competing for capital by maximizing shareholder value.

In 2016, Dominic Barton was named by Finance Minister Bill Morneau to chair the federal government’s Advisory Council on Economic Growth. The resulting widely respected report:

- Cited regulatory barriers for Canada’s oil and natural gas sector, noting the average pipeline approval time in Canada is between five and six years, which is significantly longer than in peer economies such as Australia or the U.S. where approval times are 18 to 20 months;
- Described the impact of these delays as substantial, noting Kinder Morgan estimated it spent $600 million to comply with the approval process for TMX;
- Suggested that one potential solution would be for the federal Cabinet to make rulings early in the approval process before investors have committed significant time and capital; and,
- Noted that business leaders indicated investment opportunities, competition, and access to markets were three key factors influencing their investment decisions.

**OPPORTUNITY AREA**

In this competitive environment, regulatory delays for permitting can postpone operations leading to higher costs for operators, this in turn creates uncertainties for investors. Extended delays prompt investors to look elsewhere for strong investment returns.

There is an urgent need to explore options to develop or refine the regulatory framework to promoting long-term commitments on infrastructure in a timely fashion. This includes ensuring regulatory processes are timely, efficient and outcome oriented. It is also important to ensure investors have confidence that once a project has been approved, the decision is final, and the government expects the project to proceed without undue delay and use its authorities to support this expectation.

**Longer-term Oil Demand Trends**

Access to new markets such as the Asia-Pacific region remains imperative for Canadian heavy oil supply growth and the price outlook for Western Canadian Select (WCS). Broadly speaking, there will be a general preference for supply diversification among the major Asian importers, and supplies from Canada could play a role in that strategy. There could be some initial hesitation to engage, however, given the recent experience of the Chinese national oil companies with oil sands investments, and the multiple obstacles to pipeline approvals for seaborne exports.

At the same time, Asia has also seen a significant growth in crude imports, mainly owing to declining regional production and stockpiling (especially in China). The U.S. Energy Information Agency (EIA) data shows that China imported about 7.6 million b/d of crude in 2016, with imports reaching a record high of 8.6 million b/d in December of that year. Overall, in 2016 Chinese crude imports made up about 64 per cent of total global oil demand. Moreover, between 2012 and 2016, China’s crude imports grew by about 2.2 million b/d on an average annual basis. Currently, the region imports a little more than half of its oil from the Middle East, particularly from Gulf producers. But going forward, supply diversification in Asia will be an important driver of demand for Canadian exports.

**TOP 10 SUPPLIERS OF CRUDE TO CHINA**

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<tr>
<td>Russia</td>
<td>327</td>
<td>313</td>
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<tr>
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<td>326</td>
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<td>364</td>
<td>370</td>
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<tr>
<td>Iraq</td>
<td>345</td>
<td>333</td>
<td>323</td>
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<td>319</td>
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<td>173</td>
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<td>147</td>
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<tr>
<td>Iran</td>
<td>167</td>
<td>155</td>
<td>145</td>
<td>135</td>
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<tr>
<td>Venezuela</td>
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<td>192</td>
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<tr>
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<tr>
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<td>157</td>
<td>147</td>
<td>137</td>
<td>142</td>
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<tr>
<td>UAE</td>
<td>139</td>
<td>127</td>
<td>117</td>
<td>107</td>
<td>112</td>
</tr>
</tbody>
</table>

*Source: Bloomberg, Eurasia Group*

There is a strong market for heavy oil, as refiners with high conversion, or those who are adding additional conversion capacity for heavy crude flexibility, will continue to require heavy feedstock. Since 2012, the Asia market alone has added and is planning to add more than 1.1 million b/d of heavy oil feedstock for additional feedstock flexibility. Oil sands producers should be targeting the medium-density and residue hydrocracking portion of the heavy oil markets but without access to global markets, Canadian crudes to date have not been part of this demand. Instead Canadian crudes have been landlocked due to egress issues and have been selling at a significant discount in the constrained North American market.

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32 For example, coking or residue hydrocracking capacity or those who are adding conversion capacity for crude flexibility, will continue to require heavy feedstock.
In conjunction with rising oil consumption, India has ambitious plans to boost its refining capacity. The government expects fuel demand to climb from 194 million tonnes in 2017 to as high as 335 million tonnes by 2030 and 472 million tonnes by 2040. According to a report by the Ministry of Petroleum and Natural Gas, refiners have drawn up plans to increase refining capacity by 77 per cent by 2030, which would take capacity to about 8.8 million b/d, or 438.7 million tonnes.

OPPORTUNITY AREA

Global demand growth in international markets present a long-term opportunity for Canada to achieve full value for its oil and natural gas exports while displacing other sources with less stringent environmental performance. This requires a long-term vision and approach that seeks to secure strategic energy infrastructure corridors for future development.

GLOBAL DEMAND GROWTH IN INTERNATIONAL MARKETS PRESENT A LONG-TERM OPPORTUNITY FOR CANADA TO ACHIEVE FULL VALUE FOR ITS OIL AND NATURAL GAS EXPORTS WHILE DISPLACING OTHER SOURCES WITH LESS STRINGENT ENVIRONMENTAL PERFORMANCE

Technology and Innovation

Context

The oil sands industry is a high-technology, knowledge-based industry, using some of the most advanced reservoir recovery, manufacturing and data technologies available, many of which were developed by the industry itself—such as partial bitumen upgrading and injected-hydrocarbon technologies. Both the federal government and the oil sands sector recognize that innovation and technology is the best path toward reducing the industry’s carbon footprint.

The next wave of advanced oil sands recovery will focus on lowering energy inputs, thereby continuing to reduce total GHG emissions in the effort to improve profitability while making Canadian heavy oil among the least carbon-intensive in the world.

As stated in the recent 2017 Fall Reports of the Commissioner of the Environment and Sustainable Development to the Parliament of Canada, the federal government recognizes that innovation and technology is key to meeting its commitments to reduce GHG emissions and had taken steps to fund demonstration projects through various initiatives. The report also acknowledged, the commercialization of new technologies is challenging, as they have not yet demonstrated their technological and economic potential and private sector financing is often hard to obtain given the high risk. Recognizing these and other challenges, the federal

Office of the Auditor General: “2017 Fall Reports of the Commissioner of the Environment & Sustainable Development”
government provided over $2.3 billion to support clean technology in Budget 2017. However, while this will help early stage piloting for smaller firms, commercializing such innovations in the oil sands is a highly capital-intensive endeavor and remains challenging.

Investment in innovation and technology is a key economic lever for oil sands development: it represents the ‘finding cost’ of the resource.

New technology is the primary agent for new development and the de-coupling of production growth from GHG emission growth. It is the tool to reduce supply cost, which is key to the goal of keeping the sector competitive, creating jobs, and moving the needle on other key government priorities.

The industry has historically been a leader in technological developments, as seen by the successful commercialization of cyclic steam stimulation (CSS) in the 1980s and steam assisted gravity drainage (SAGD) in the 1990s, which both positioned Canada’s oil sands industry as a world-class producer of petroleum products, providing significant job creation and GDP growth. There has been continuous advancement of innovation over the past decades with associated improvements in GHG emissions intensity, water usage, and resource recovery. It also exceeded investment and production forecasts and provided significant job creation and GDP growth.

**Emerging Technologies**

**Advanced Oil Sands Recovery Technologies**

Advanced oil sands recovery (AOSR) technologies, such as injected hydrocarbon technologies, can bring added value to the oil sands industry and reduce GHG emissions intensity. Hydrocarbon-based technologies use injected hydrocarbon such as propane or butane as a steam replacement for bitumen extraction from oil sands reservoirs, thus using less water and creating fewer emissions than typical steam-only processes. Novel processes such as these can help reduce costs and reduce the environmental impacts of oil sands operations.

Unlocking such steam-reducing technologies could be a game-changing advance, rivaling the commercialization of steam-assisted gravity drainage (SAGD) in the 1990s. An enormous opportunity exists around commercialization of AOSR: the potential for similar production capacity increases as the industry experienced with SAGD, along with corresponding job and government revenue increases — this time coupled with significant emissions intensity reduction.

The following figure illustrates technological stages of various injected hydrocarbon technology. Commercialization has potential to significantly reduce costs and emissions, enabling these emerging technologies to become the processes of choice for oil sands development.

<table>
<thead>
<tr>
<th>Desired Direction</th>
<th>COST</th>
<th>Supply Cost (C$/bbl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAGD Base</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steam IH</td>
<td>IH</td>
<td>0</td>
</tr>
<tr>
<td>Cogen</td>
<td>IH</td>
<td>10</td>
</tr>
<tr>
<td>Steam/CO₂/Co-inject</td>
<td>IH</td>
<td>20</td>
</tr>
<tr>
<td>Brownfield</td>
<td>IH</td>
<td>30</td>
</tr>
<tr>
<td>Steam IH</td>
<td>IH</td>
<td>40</td>
</tr>
<tr>
<td>Steam with Cogen</td>
<td>IH</td>
<td>50</td>
</tr>
<tr>
<td>IH</td>
<td></td>
<td>60</td>
</tr>
</tbody>
</table>

**Clean Reservoir Technologies Under Development**

It takes time and significant investment to implement new technologies, as the oil sands has a distinctive risk profile. The assessment of risk is fundamental to the investment required. Introducing new technologies to the oil sands is capital-intensive. The risk on oil sands technology is at the front end, hence, fiscal levers and certainty can contribute in overcoming this hurdle and commercializing technology.

**Transitioning to Steam Reduction Technologies in Oil Sands**

Industry has modelled this by using a phased approach to injected-hydrocarbon assisted SAGD (IHA SAGD) technology, to reflect the impact of gradual implementation of innovation over time. As seen in the figure above, using Wood Mackenzie data, commercializing new technology is a staged approach from existing SAGD technology to full IHA SAGD commercialization over a number of years. The resulting impact is a reduction of steam/oil ratios (SORs) and energy intensity of 25 per cent from current Wood Mackenzie ‘Generic’ SAGD technology.
Partial Upgrading

Currently, almost 60 per cent of Alberta’s oil sands production is marketed as non-upgraded bitumen which is exported after being blended with diluent to allow transport.\(^{34}\) Bitumen from the oil sands is highly viscous and does not flow on its own. It cannot be moved in pipelines in undiluted form. Oil sands bitumen is typically blended with diluent, a very light oil, to create a diluted bitumen, or dilbit, that can flow through pipelines.

Partial upgrading (PU) is a new technology that has both environmental and competitive advantages, thereby increasing the value of Canada’s oil sands production to Canadians. PU is a process that breaks down the bitumen thereby upgrading the bitumen to pipeline quality without the need for diluent.

This process reduces the energy required to upgrade the bitumen, thereby reducing GHG emissions intensity, the energy requirements in transportation, resulting in an estimated reduction to emissions of existing well-to-refinery emissions up to 12 per cent.\(^{35}\) Capital and operating costs are also reduced, improving the return on investment on oil sands projects while moving forward in the transition to lower-carbon production.

An added benefit of PU is the partial or full elimination of diluent requirements, which results in increased pipeline capacity by up to 30 per cent for the same volume of bitumen. It can also increase the number of refineries that can process Alberta’s heavy oil production, increasing market share. Partial upgrading in and of itself does not alleviate egress issues with Canadian heavy crude, as a 200,000 b/d of partial upgrading capacity would only free up between 30,000 to 60,000 b/d of overall pipeline space, but it is relieving some pressure to the existing system.

Investment in technology in the oil sands industry is significantly more capital-intensive than other R&D sectors such as information technology, as firms in the emissions-reduction sphere require long term capital, especially in the energy and manufacturing sectors.\(^{36}\) Pre-commercial demonstrations alone can cost hundreds of millions of dollars. Reasonable timelines must be anticipated for a suite of potential technologies to yield successful projects that can be deployed at commercial scale. Financial and operational barriers can also come into play at the deployment stage.

The industry needs the right fiscal and R&D framework to encourage commercialization of these promising but capital-intensive technologies.

Current market conditions make it very difficult for companies to commercialize new technologies due to the drain on cash flow during the commercialization stage of technological development and the inability to attract capital investment into the industry.

To realize this opportunity, these technologies still need to be commercialized. Commercialization will require the construction and operation of a demonstration facility, which serves two purposes: demonstration of the technology at a near-commercial scale; and that the new upgraded material is acceptable to refinery customers (and that refineries will pay a price that is sufficient to justify the investment).

**INDUSTRY NEEDS THE RIGHT FISCAL AND R&D FRAMEWORK TO ENCOURAGE COMMERCIALIZATION OF PROMISING BUT CAPITAL-INTENSIVE TECHNOLOGIES.**

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**TECHNOLOGY DEVELOPMENT TAKES TIME AND SIGNIFICANT INVESTMENT**

| Years | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| CSS R&D / Piloting | Commercial Production | R&D / Piloting | Commercial Production | R&D / Piloting | Early Commercialization Stage | R&D / Piloting | Non-thermal Injected Hydrocarbon processes | New recovery technology development | Regulatory application and approval process, with environmental impact assessment | Detailed engineering, procurement, construction and startup | Barriers: Time for focused R&D | Efficient approval process | Global competitiveness |

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35 Ibid.
36 “Unlocking Innovation To Drive Scale & Growth”, Advisory Council on Economic Growth, 2017
The resources are in Canada and have to be produced here but value-added investments such as partial upgrading and refining can take place anywhere. The investment challenge for value-added investment is illustrated in the pre-commercialization facility waterfall chart below. Once completed, this project will remove 100 per cent of the diluent requirements associated with transporting bitumen to market and will increase the price upstream producers are able to obtain for their product. As seen in the figure below, American fiscal policy provides a 130 per cent improvement in the value created by this opportunity.

The introduction of immediate deductibility of capital costs and recognizing value-added investments in the Canadian economy that reduce overall GHG emissions are potential levers examined to encourage value-added investments into Canada. Canadians would realize greater value for our resources.

Opportunity Assessments

Immediate Capital Deductibility

Immediate deductibility of capital costs for mining, including in situ oil sands, was introduced by the federal government in 1996 (Class 41a) and phased out beginning in Budget 2007. This was the key catalyst in unlocking the first wave of commercialized technology that made SAGD viable and was the catalyst that unlocked the critical mass of viable production and the numerous of economic benefits Canada-wide.

The implementation of immediate deductibility for tangible capital on oil sands investment accelerated the commercialization of new technologies, as seen in the figure on the following page from Canada’s first wave of oil sands technological advancement. There is an opportunity to support new technologies such as IHA and PU by providing immediate deductibility.

*Based on cash flows given in real terms.

Source: CAPP
Collaboration with Industry, Academia and Government

In order for Canada to become a leader in commercializing R&D, increased collaboration among industry, academia and government is required in order to focus innovation towards technologies that have industry demand pull and have highest probability of taking technologies from idea stage to commercialization. This will include addressing the barriers from intellectual property (IP) ownership and lack of harmonization for IP processes across universities. The benefits would include a faster pace of innovation, leveraging of resources, and improved technology and innovation solutions.

Access to Capital for Late-stage R&D

The capital-intensive nature of the industry and the technical and financial risk have made it difficult for companies to raise the capital necessary to commercialize technologies such as injected hydrocarbons and partial upgrading, which will significantly reduce the life-cycle GHG emissions intensity of the barrels. For example, grants are typically less than $10 million, which supports technology readiness levels (TRL) 1 through 4, but larger scale funding is required for the TRL 5 through 9 (namely technology demonstration to full commercialization) projects to construct the field-scale commercial demonstration facilities required to complete the late stages of the R&D process.

FOR CANADA TO BECOME A LEADER IN COMMERCIALIZING R&D, INCREASED COLLABORATION AMONG INDUSTRY, ACADEMIA AND GOVERNMENT IS REQUIRED.
The real opportunity presented by technology and innovation is national prosperity and global leadership in environmental performance improvement. The oil sands industry already represents investment in a high-value product, and further growth in investment translates into thousands of skilled middle-class jobs across Canada, reduction of GHG emissions, expansion of government revenues, collaborative development of exportable technology, and spin-offs to small- and medium-sized businesses.

The right investments and partnerships that encourage commercialization of the next wave of technological advancements can deliver the breakthroughs and investment required to optimize the value of oil sands product manufacturing, while reducing costs and achieving substantial environmental benefits. This reset vision of the oil sands has the potential to make Canadian crude production, specifically in situ bitumen production — where there is substantial technological merit — the crude oil of choice for heavy refiners and expand both domestic and international markets considerably.

Summary of Modelling Results

Context

The analysis was undertaken to inform evaluation of potential policy levers, by building a common understanding of:

- The impact of near-term tax and policy changes on sector level competitiveness;
- The linkage between a change in competitiveness and incremental investment within the oil sands that would not take place without these levers;
- The potential for proposed policy levers to accelerate the implementation of new recovery technology within the oil sands sector, which would also reduce emissions;
- The related economic benefits for Canada

The approach involved analyzing the impacts at a play (facility) level relative to other competitive plays (in this case, U.S. Gulf of Mexico deep water projects), a sector-level that considers the impacts for the oil sands sector more broadly, and an overall macroeconomic level that considers the economic impacts (e.g. GDP, jobs) for Canada.

Oil Sands Modelling — Play Level

The play-level approach models three oil sands steam assisted gravity drainage (SAGD) facilities, each with a 35,000 b/d capacity, which is typical of oil sands project developments.\(^{37}\) The levers that were modelled include market access, 100 per cent immediate capital deductibility, carbon pricing (including Clean Fuel Standard and carbon price), a 1 per cent decrease in the corporate tax rate, and the application of injected hydrocarbon technology.\(^{38}\) Economics associated with various policy scenarios were benchmarked against similar long cycle opportunities in the U.S. Gulf of Mexico\(^ {39}\) based on the industry metrics of internal rate of return (IRR) and net present value (NPV).\(^ {40}\)

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37 Three facilities were chosen to reflect the gradual implementation of Injected Hydrocarbon Assisted (IHA) SAGD technology as discussed in the innovation section. This technology is expected to help close the competitiveness gap by improving project economics and will also reduce GHG emission intensity.

38 More detail on the levers is included in the oil sands modelling appendix. The impact of policy levers was calculated using the Wood Mackenzie Global Economic Model.

39 Benchmarking to Gulf of Mexico (GOM) Deepwater represents a useful comparator because they have similar characteristics to the oil sands: Both types of projects require significant capital expenditures before reaching first oil and both types of projects deliver long-lived, steady production which translates to a predictable stream of cash flows. The IRRs represent actual and probable final investment decisions (FIDs) as tracked by Wood Mackenzie.

40 Net Present Value (NPV) is the present value of the after-tax cash flows generated by the project — which can be thought of as its economic value. The internal rate of return (IRR) is the discount rate at which the NPV equals zero - if the IRR is higher than company’s cost of capital, then the project will add economic value, provided its risk is not different than the company average.
Key Findings

The addition of market access increases the IRR by 4.3 per cent, which is the most substantial impact of all the levers. However, solving market access issues alone will not be enough to solve competitiveness issues for Canada’s oil sands. Under the Wood Mackenzie base case (which assumes market access and no climate policy costs), oil sands projects remain competitively challenged with an IRR percentage gap to Gulf of Mexico (GOM) opportunities of at least 1 per cent.

Assuming the issue of market access is addressed (largely through the construction of existing approved pipelines), the generic oil sands facility is comparable to average U.S. GOM IRR percentage on a pre-tax basis, but the gap more than doubles when after-tax returns are considered.

- The addition of Clean Fuel Standard and Incremental carbon tax reduces the IRR percentage of the project by 1.5 per cent;\(^\text{41}\)
- Implementing 100 per cent immediate deductibility in the year the capital is spent is a key lever to improve competitiveness, in that it improves the project IRR by 1.7 per cent;\(^\text{42}\)
- The introduction of Injected Hydrocarbon Assisted (IHA) technology brings an incremental IRR uplift of 2.2 per cent;
- Industry requires cash flows in order to innovate: while the potential of technological innovation to close the competitiveness gap is significant, the oil sands is a learning by doing industry and the pace of commercialization of new technology is dependent on being competitive.
- Addressing these levers combined bring oil sands SAGD projects into a competitive position with comparable U.S. GOM projects.

\(^\text{41}\) There exists uncertainty with respect to the cost of the Clean Fuel Standards (CFS) policy. Base Case modelling has assumed $100 / T. For sensitivity analysis including a $75 / T scenario, see the oil sands modelling appendix. Existing carbon tax of $0.36 / bbl (included in "Starting Economics" bar of the waterfall). Incremental carbon tax of $0.91 / bbl.

\(^\text{42}\) According to the National Task Force on Oil Sands Strategies "Rapid amortization of capital is the best fiscal lever available to governments to promote investment in growth and innovation in the oil sands as it:

- Removes discrimination against investment in innovation versus carrying on with the operating costs inherent in the existing technology; AVOIDS government subsidies;
- Minimizes the period when the initial investment capital is at risk; ENCOURAGES companies to make business decisions based on sound economic, technological and environmental principles;
- Provides the best opportunity for economic rent if and when investments are profitable; PROVIDES the best ratio of incentive to forgone tax/royalty revenue.

Source: Wood Mackenzie Global Economic Model
COMPARISON OF RETURNS BEFORE AND AFTER TAX (ASSUMES MARKET ACCESS)

Source: Wood Mackenzie Global Economic Model

**Key Findings: Investment and Production**

Under the growth scenario, industry will see incremental investment of $5.2 billion per year (2018 real dollars) between 2019 and 2037, driven primarily by strategic investment in new in situ capacity. This translates into 1,260 million barrels per day (Mb/d) of in situ capacity, 100 Mb/d of mining capacity, 150 Mb/d of partial upgrading capacity by 2034. Investment activity peaks towards the end of the next decade as IHA processes are commercialized and improving economics induce the construction of significant new capacity versus the base case.

**ANNUAL OIL SANDS INVESTMENT $MM**

Source: CAPP

**OIL SANDS BITUMEN PRODUCTION (mbpd)**

Source: CAPP

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**Sectoral Rollup**

The sectoral rollup involves assessing the increased investment in the sector that would occur if the competitiveness issues identified at the play level are addressed. The two scenarios analyzed include:

1. **Business as Usual (BAU) Case** - assumes market access challenges persist, incremental climate costs are applied to industry, and no immediate deductibility is provided. Average annual capital investment of $13 billion (2018 real dollars). This is roughly in line with the Canadian Association of Petroleum Producers’ 2018 capital forecast ($12 billion) where the majority of capital spending is dedicated to sustaining activities.

2. **Growth Case** - assumes market access over the life of the project; industry gains EITE protection through a combination of 100 per cent exemption from the Clean Fuel Standard regulation and carbon price EITE, and 100 per cent immediate deductibility for the write-off of all capital in the year it is incurred is implemented. Incremental investment of $5.2 billion per year (2018 real dollars) between 2019 and 2037. Capital investment remains at levels well below historical highs but the trend of consistent investment decline that has occurred the past four years is reversed.
Key Findings: Innovation and GHG Performance

The commercialization of GHG reduction technologies in the oil sands under the growth scenario have the potential to substantially improve industry emissions performance. It is expected emissions intensity will fall for existing in situ and mining technology driven by increased boiler efficiency, well productivity, and injected hydrocarbons being implemented within sustaining drilling programs.\(^{43,44}\)

Aggregate oil sands emissions (excluding cogeneration and upgrader expansion) are projected to increase from 62 to 64 megatonnes (MT) to about 80 MT by 2035.\(^ {45}\)

**AGGREGATE OIL SANDS GHG EMISSIONS* UNDER GROWTH CASE**

* Excludes emissions from cogeneration and upgrader expansion

![Chart showing AGGREGATE OIL SANDS GHG EMISSIONS* UNDER GROWTH CASE](chart.png)

Note: Based on OSAG recommended emission limit that excludes, but is not limited to, the GHG emissions associated with primary production, enhanced recovery, experimental schemes, co-gen, and up to 10 MT of new upgrading capacity or expansion of existing upgrading capacity.

Source: CAPP with data from IHS and CERI

Key Findings: Impacts on the Canadian Economy

The incremental investment attributable to policy action in the Growth scenario provides material economic benefits, demonstrating importance of oil and natural gas competitiveness to the Canadian economy. General Equilibrium Modeling (GEM) shows the incremental $19 billion per year of annual investment in LRNG, LNG, and oil sands relative to the BAU case sustains an increase of $45.4 billion of GDP by 2030 (with incremental GDP increases before then). It is estimated that the approximately $5 billion annual incremental oil sands investment relative to the BAU case increases real GDP by $8.5 billion in 2030, and is expected to further increase relative to the BAU case beyond that (years past 2030 were not modelled). Furthermore, separately conducted Input/output modelling shows the incremental oil and natural gas activity provides significant growth of inclusive employment opportunities for Canadians, sustaining the addition of ongoing 120,000 direct and indirect jobs on average through to 2030, with an estimated 50,000 of those due to oil sands activity. Since incremental activity is expected to continue past 2030, the average number of jobs sustained between 2031 and 2037 is anticipated to grow to 120,000 for the oil sands. Incremental government revenues from incremental activity in LRNG, LNG, and oil sands are expected to average $7.5 billion per year, with incremental oil sands royalties averaging $600 million per year.

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\(^{43}\) CAPP with IHS and CERI data.


\(^{45}\) Aligns with The Oil Sands Advisory Group (OSAG) recommendations on implementation of the oil sands emissions limit established by the Alberta Climate Leadership Plan (ACLP), 2017. Exclusion of co-gen ensures that oil sands operators who choose to generate their own electricity are treated equivalently with those who import electricity from the grid. The provision for 10 Mt of upgrading capacity enables some level of carbon emissions associated with value-adding upgrading activities.
Branding

Context

Canada is a reliable and affordable supplier of energy and the oil and natural gas industry has improved the prosperity of our nation. Canada's oil sands are a vital energy source but opposing views about the sector have eroded the sector's reputation, and public pressure has challenged its economic viability. The sector must build a narrative that positions the oil sands industry as a key player in Canada's long-term economic future while being a global leader in innovation and environmental performance.

To this outcome, public sentiment must be improved to afford government the opportunity to make effective policy changes and improve the competitiveness of the oil sands sector.

A successful brand will influence Canadians to consider that:
- A strong oil sands industry drives a strong national economy by attracting capital, creating jobs, supporting public services and doing business with other sectors of our economy;
- Construction of approved pipelines without delay is essential to reach new markets and receive higher value for Canada's resources;
- Canada's oil sands sector is innovative and is world-class in accelerating the pace of productivity and environmental performance improvement; and,
- Government priorities align with the long-term commitment to develop oil sands.

THE SECTOR MUST BUILD A NARRATIVE THAT POSITIONS THE OIL SANDS INDUSTRY AS A KEY PLAYER IN CANADA'S LONG-TERM ECONOMIC FUTURE WHILE BEING A GLOBAL LEADER IN INNOVATION AND ENVIRONMENTAL PERFORMANCE.

Public Opinion Research

Public opinion research has demonstrated a three-year trend that suggests the majority of Canadians support the oil and natural gas industry. As of May 2018, 48 per cent of Canadians support oil sands development while only 31 per cent oppose. (Source: Ipsos Oil and Natural Gas National Polling May 2018).

The key findings of the research indicate that Canadians agree with the benefits of oil and natural gas at all levels, and continue to generally support the industry. However, when considering energy alternatives, these are seen to be more aspirational than realistic.

In developing an effective oil sands brand, the data suggests that:
- The brand strategy must provide a realistic perspective on the future, including Canada in both domestic and global contexts;
- The majority of Canadians are willing to see the oil sands industry grow if their conditions are met;
- There is a need to reassure Canadians about their concerns – particularly about safety, the environment, and local economic benefits;
- It is essential to continue to reassure Canadians that innovation and science are key pillars in oil sands development; and,
- Industry and government must be seen to work together in an open, honest, ethical and transparent way.

Opportunity Assessments

Industry has identified areas that could be explored including the above-referenced context and public opinion research to inform the development of a brand that promotes the growth of the oil sands industry. One approach, outlined below, would see a strategy delivered in concert with industry and provincial governments:

- Inform, involve, inspire and enroll Canadians to support the development of oil sands:
  - Engage a professional marketing firm that can develop a multi-year approach that builds the brand of Canada's oil sands;
  - Narrow the focus of messages on Canadian values and on issues that have personal relevance for the audience; and,
  - Increase interactions with Canadians by using social media and enlisting Indigenous communities, rural communities and trade organizations.

- Quantify and proactively communicate oil sands contribution to the economy while meeting government priorities:
  - National and regional socio-economic contribution to connect a strong energy future to a prosperous future for Canada;
  - Economic contribution for Canada's Indigenous peoples; and,
  - Contribution to gender equity in the workplace.
Conclusions

Assessments of potential levers and opportunities for the oil sands include a market driven science and technology innovation system that results in growing production while changing the trajectory of emissions, lowering supply cost, a new competitive and certain fiscal regime coupled with fair, predictable, timely and competitive regulation, and improving access to opportunities in our sector to traditionally under-represented groups, so all Canadians can benefit.

Key facets were explored in the areas of market access, branding, business and investment climate, and technology and innovation. No single lever is sufficient, as all levers influence investment decisions. Analysis concluded that resolving market access issues alone will not be enough to close the current competitiveness gap within oil sands. Additional policy levers will be required to create a competitive business environment.

Modelling of representative long-cycle economics demonstrates a competitiveness gap between Canadian oil sands investments and similar long-cycle opportunities in the Gulf of Mexico. This gap is largely a result of recent U.S. tax regime changes, plus the incremental regulatory cost of climate policies in Canada. It has the effect of exacerbating the economic challenges for oil sands operators and making it more difficult to invest to accelerate the pace of new technology implementation.

The following are key opportunities that have been identified for potential action by governments in the near terms:

- Immediate deductibility of capital costs as this significantly improves industry’s project economics, reduces uncertainty and risk, in addition to driving investment in capital intensive oil sands technology and thereby driving innovation;
- Develop or refine the regulatory framework so it is conducive to promoting long-term commitments on infrastructure in a timely fashion;
- Increase collaboration among industry, academia and government in order to focus innovation towards technologies that have industry demand pull and have highest probability of taking technologies from idea stage to commercialization:
  - Include addressing the barriers from intellectual property (IP) ownership and lack of harmonization for IP across universities; and,
  - Analysis of the current innovation funding polices to help bridge the gap for late stage R&D funding for oil sands investment with potential new funding focusing on enabling late-stage, field-scale R&D.
- Enhance the reputation of the Canadian oil sands sector by deploying a re-framed narrative based on balanced policy, improvement in the industry’s environmental and social performance, Canada’s role in reducing global GHG emissions and the sector’s contribution to economic prosperity in Canada, and communicating and engaging more effectively with Canadian and global audiences.

Given the increasing global demand for oil and gas in the coming decades, this oil sands vision has the potential to make Canadian crude production the crude of choice for heavy refiners, both here and abroad, as we expand our markets. The future of the oil sands broadly impacts Canadians, as does the scope of its potential benefits. The real opportunity is national prosperity and global leadership as the oil sands is a unique window of opportunity to meet global demand with Canadian oil, as opposed to continuing to see oil sands investment decrease while other jurisdictions fill that global demand.
SECTION 5: Appendices

Appendix A – Glossary
Appendix B – Summary of Opportunity Areas
Appendix C – Tax Framework
Appendix D – Ease of Tax Compliance and Administration
Appendix E – Modelling
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADM</td>
<td>assistant deputy minister</td>
</tr>
<tr>
<td>AECO</td>
<td>natural gas pricing hub in Alberta</td>
</tr>
<tr>
<td>AER</td>
<td>Alberta Energy Regulator</td>
</tr>
<tr>
<td>AMT</td>
<td>alternative minimum tax</td>
</tr>
<tr>
<td>AOSR</td>
<td>advanced oil sands recovery</td>
</tr>
<tr>
<td>ATI</td>
<td>adjusted income</td>
</tr>
<tr>
<td>BAU</td>
<td>business as usual</td>
</tr>
<tr>
<td>bbl</td>
<td>barrel (oil)</td>
</tr>
<tr>
<td>b/d or bpd</td>
<td>barrels per day (oil)</td>
</tr>
<tr>
<td>Bcf/d</td>
<td>billion cubic feet per day (natural gas)</td>
</tr>
<tr>
<td>CAPEX</td>
<td>capital expenditure</td>
</tr>
<tr>
<td>CAPP</td>
<td>Canadian Association of Petroleum Producers</td>
</tr>
<tr>
<td>CCA</td>
<td>capital cost allowance</td>
</tr>
<tr>
<td>CCPC</td>
<td>Canadian-controlled private corporation</td>
</tr>
<tr>
<td>CSS</td>
<td>cyclic steam stimulation</td>
</tr>
<tr>
<td>CDE</td>
<td>Canadian development expense</td>
</tr>
<tr>
<td>CEE</td>
<td>Canadian exploration expense</td>
</tr>
<tr>
<td>CFS</td>
<td>Clean Fuel Standard</td>
</tr>
<tr>
<td>CO₂</td>
<td>carbon dioxide</td>
</tr>
<tr>
<td>CO₂e</td>
<td>carbon dioxide equivalent</td>
</tr>
<tr>
<td>COGPE</td>
<td>Canadian oil and gas property expenses</td>
</tr>
<tr>
<td>COSIA</td>
<td>Canada’s Oil Sands Innovation Alliance</td>
</tr>
<tr>
<td>CRA</td>
<td>Canada Revenue Agency</td>
</tr>
<tr>
<td>EBI</td>
<td>earning before interest and taxes</td>
</tr>
<tr>
<td>EBITDA</td>
<td>earnings before interest, taxes, depreciation and amortization</td>
</tr>
<tr>
<td>ECCC</td>
<td>Environment and Climate Change Canada</td>
</tr>
<tr>
<td>E&amp;D</td>
<td>exploration and development</td>
</tr>
<tr>
<td>EITE</td>
<td>emissions-intensive trade-exposed</td>
</tr>
<tr>
<td>EMMC</td>
<td>Energy and Mines Ministers’ Conference</td>
</tr>
<tr>
<td>EIA</td>
<td>Energy Information Agency (U.S.)</td>
</tr>
<tr>
<td>ENGO</td>
<td>environmental non-government organization</td>
</tr>
<tr>
<td>ESTMA</td>
<td>Extractive Sector Transparency Measures Act</td>
</tr>
<tr>
<td>FDI</td>
<td>foreign direct investment</td>
</tr>
<tr>
<td>FID</td>
<td>final investment decision</td>
</tr>
<tr>
<td>GBA+</td>
<td>gender-based analysis plus</td>
</tr>
<tr>
<td>GDP</td>
<td>gross domestic product</td>
</tr>
<tr>
<td>GEM</td>
<td>general equilibrium modelling</td>
</tr>
<tr>
<td>GHG</td>
<td>greenhouse gas (emissions)</td>
</tr>
<tr>
<td>GOM</td>
<td>Gulf of Mexico</td>
</tr>
<tr>
<td>IDA</td>
<td>integrated decision approach</td>
</tr>
<tr>
<td>IDC</td>
<td>intangible drilling costs</td>
</tr>
<tr>
<td>IEA</td>
<td>International Energy Agency</td>
</tr>
<tr>
<td>IHA</td>
<td>injected hydrocarbon assisted</td>
</tr>
<tr>
<td>IP</td>
<td>intellectual property</td>
</tr>
<tr>
<td>IRR</td>
<td>internal rate of return</td>
</tr>
<tr>
<td>IRS</td>
<td>Internal Revenue Service (U.S.)</td>
</tr>
<tr>
<td>ITC</td>
<td>investment tax credit</td>
</tr>
<tr>
<td>JWG</td>
<td>Joint Working Group</td>
</tr>
<tr>
<td>KXL</td>
<td>Keystone Export Limited pipeline</td>
</tr>
<tr>
<td>LKE</td>
<td>like-kind exchange</td>
</tr>
<tr>
<td>LNG</td>
<td>liquefied natural gas</td>
</tr>
<tr>
<td>LRNG</td>
<td>liquids-rich natural gas</td>
</tr>
<tr>
<td>LTO</td>
<td>light tight oil</td>
</tr>
<tr>
<td>MACRS</td>
<td>modified accelerated cost recovery system</td>
</tr>
<tr>
<td>Mb/d or mbpd</td>
<td>million barrels per day (oil)</td>
</tr>
<tr>
<td>Mcf or mcf</td>
<td>million cubic feet (natural gas)</td>
</tr>
<tr>
<td>MLPs</td>
<td>Master Limited Partnerships</td>
</tr>
<tr>
<td>MT</td>
<td>megatonnes</td>
</tr>
<tr>
<td>NDC</td>
<td>nationally determined contribution</td>
</tr>
<tr>
<td>NG</td>
<td>natural gas</td>
</tr>
<tr>
<td>NGL</td>
<td>natural gas liquids</td>
</tr>
<tr>
<td>NGTL</td>
<td>Nova Gas Transmission Limited</td>
</tr>
<tr>
<td>NOLs</td>
<td>net operating losses</td>
</tr>
<tr>
<td>NPV</td>
<td>net present value</td>
</tr>
<tr>
<td>NRCan</td>
<td>Natural Resources Canada</td>
</tr>
<tr>
<td>NYMEX</td>
<td>New York Mercantile Exchange</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
</tr>
<tr>
<td>OS</td>
<td>oil sands</td>
</tr>
<tr>
<td>PU</td>
<td>partial upgrading</td>
</tr>
<tr>
<td>QBI</td>
<td>qualified business income</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>research and upgrading</td>
</tr>
<tr>
<td>RESCI</td>
<td>Regional Electricity Cooperation and Strategic Infrastructure Initiative</td>
</tr>
<tr>
<td>SAGD</td>
<td>steam-assisted gravity drainage</td>
</tr>
<tr>
<td>SOR</td>
<td>steam/oil ratios</td>
</tr>
<tr>
<td>SR&amp;ED</td>
<td>Scientific Research and Experimental Development program</td>
</tr>
<tr>
<td>STEM</td>
<td>science, technology, engineering and mathematics</td>
</tr>
<tr>
<td>t</td>
<td>tonne</td>
</tr>
<tr>
<td>TMX</td>
<td>Trans Mountain Expansion pipeline</td>
</tr>
<tr>
<td>TRL</td>
<td>technology readiness levels</td>
</tr>
<tr>
<td>WBF</td>
<td>Women Building Futures</td>
</tr>
<tr>
<td>WCS</td>
<td>Western Canadian Select (heavy oil blend, Canadian oil price benchmark)</td>
</tr>
<tr>
<td>WinSETT</td>
<td>Women in Science, Engineering, Trades and Technology</td>
</tr>
<tr>
<td>WTI</td>
<td>West Texas Intermediate (light crude oil, U.S. oil price benchmark)</td>
</tr>
<tr>
<td>YWE</td>
<td>Young Women in Energy</td>
</tr>
</tbody>
</table>
Overview

The opportunity levers identified in the course of this work have been prioritized, particularly as reflected in the Executive Summary of this report. The purpose of this Appendix is to summarize all of the potential opportunity levers that were identified, as all of these levers have merit and may warrant consideration in the future. Opportunities in orange are key priorities.

LEGEND:
- Opportunities in orange are those that are the key priorities.

<table>
<thead>
<tr>
<th>SUMMARY OF AREAS OF OPPORTUNITY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Joint</strong></td>
</tr>
<tr>
<td><strong>Business Investment Climate</strong></td>
</tr>
</tbody>
</table>

**THEME: Fiscal policies**

**Opportunity 1:** Allow immediate deductibility of capital costs for tax purposes in the year in which they occur, to be applied broadly across the economy in a manner that aligns with similar tax reforms in the U.S. while providing collateral benefit of enhancing the ease of tax compliance and administration.

**Opportunity 2:** Reduce Canada’s overall corporate tax income tax rate by 1%, thereby matching the U.S. average rate.

**Opportunity 3:** Jointly examine innovative approaches to financing for small/medium sized firms in the upstream oil and natural gas sector.

**THEME: Innovation (SR&ED)**

**Opportunity 1:** Proceed with the government’s commitment to the 2017 budget to review the SR&ED tax credit program, with a view to making it more effective through risk-sharing, inclusion of operational innovation within scope, providing greater certainty in the application process, simplifying the audit process and providing greater support for projects throughout the innovation lifecycle.

**THEME: Climate Related Policies**

**Opportunity 1:** Increase the level of protection to approximately 80% coverage of the aggregate compliance cost for EITE industries, in order to address the competitiveness gap and to avoid carbon leakage.

**Opportunity 2:** Advance a nationwide offset system to provide high quality, lower cost competitive options that are not subject to usage limits or expiry.

**Opportunity 3:** Continue to take a leadership role in framing the opportunity for international recognition of Canada’s progress in reducing global GHG emissions via its natural gas exports, and in seeking international credits via trade agreements under Article 6 of the Paris Agreement.

**THEME: Inclusiveness**

**Opportunity 1:** Governments and industry to partner with Indigenous peoples to promote inclusive growth of the upstream oil and gas sector, specifically building upon / developing targeted programs to increase participation of Indigenous women, who are largely under-represented in the sector.
### SUMMARY OF AREAS OF OPPORTUNITY

#### LRNG

<table>
<thead>
<tr>
<th>Market Access</th>
<th>Technology and Innovation</th>
<th>Branding</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>THEME: Pipeline Access to U.S. and Eastern Canada Markets</strong>&lt;br&gt;<strong>Opportunity 1:</strong> Enhance the competitiveness of Canadian natural gas by taking action to reduce pipeline rates and increasing capacity of Canadian natural gas pipelines serving markets where consumers have diversity supply alternatives, including accelerating the regulatory review process for NGTL debottlenecking to ensure Canadian gas remains competitive in those markets.&lt;br&gt;<strong>Opportunity 2:</strong> Reduce transportation rates on Canadian pipelines which serve markets also supplied by U.S. gas.&lt;br&gt;<strong>Opportunity 3:</strong> Assess alternative mechanisms for funding development of new infrastructure.&lt;br&gt;<strong>THEME: Natural Gas Market Growth in Canada</strong>&lt;br&gt;<strong>Opportunity 1:</strong> Enable transition from coal-fired electricity generation and gas-fired generation.&lt;br&gt;<strong>Opportunity 2:</strong> Foster development of Canadian petro-chemical, fertilizer, methanol, and olefins projects using natural gas and/or natural gas liquids as feedstock.&lt;br&gt;<strong>Opportunity 3:</strong> Consider strategies to allow higher Canadian exports of condensate and other light hydrocarbons.&lt;br&gt;<strong>THEME: LNG Export Infrastructure</strong>&lt;br&gt;<strong>Opportunity 1:</strong> Visibly support and take action to advance the development of an LNG industry on Canada’s West Coast, with the development of multiple LNG plants over time to provide access to global gas markets. The market window will otherwise continue to be seized by LNG projects in other jurisdictions.&lt;br&gt;<strong>Opportunity 2:</strong> Pursue potential for LNG projects to provide significant potential for Indigenous participation, jobs and business opportunities.&lt;br&gt;<strong>THEME: Increasing Collaboration</strong>&lt;br&gt;<strong>Opportunity 1:</strong> Enable accelerated collaborative technology and innovation in the sector, particularly as it relates to technologies with potential to increase recovery efficiency, reduce costs and reduce GHG emissions.&lt;br&gt;<strong>THEME: Electrification</strong>&lt;br&gt;<strong>Opportunity 1:</strong> Examine upstream and downstream LNG electrification opportunities in more detail (taking into account the need to address economic risks, infrastructure constraints and funding mechanisms).&lt;br&gt;<strong>THEME: Infrastructure Opportunities</strong>&lt;br&gt;<strong>Opportunity 1:</strong> Progress partnership opportunities between industry and government to assess regulatory streamlining opportunities and strategic infrastructure investments, both of which could facilitate domestic frac sand development and transportation infrastructure required for development.&lt;br&gt;<strong>Theme: Reputation/Brand</strong>&lt;br&gt;<strong>Opportunity 1:</strong> Enhance the reputation/brand of the Canadian natural gas sector by creating a refreshed narrative for the sector - founded on balanced policy, improvement in the industry’s environmental and social performance, Canada’s role in reducing global GHG emissions and the sector’s contribution to economic prosperity in Canada and globally – and communication and engaging more effectively with Canadian and global audiences using this new narrative.</td>
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</tbody>
</table>

#### Oil Sands

<table>
<thead>
<tr>
<th>Market Access</th>
<th>Technology and Innovation</th>
<th>Branding</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>THEME: Regulatory Process &amp; Infrastructure</strong>&lt;br&gt;<strong>Opportunity 1:</strong> Undertake reforms to the regulatory framework in a manner that strengthens investor confidence and encourages long-term investment in energy infrastructure.&lt;br&gt;<strong>Opportunity 2:</strong> Continue to advance efforts to expand market access for Canadian heavy oil, through support and endorsement of approved pipelines and expansion projects (including TMX, KXX and Enbridge Line 3).&lt;br&gt;<strong>THEME: Encourage Innovation</strong>&lt;br&gt;<strong>Opportunity 1:</strong> Encourage oil sands innovation through a combination of fiscal tools (e.g., immediate deductibility), expanded access to government funding for late stage R&amp;D and strengthening linkages among industry, government and academia.</td>
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#### Proposed Actions to Address the Competitiveness of Canada’s Upstream Oil and Natural Gas Sector

Section 5: APPENDIX B - SUMMARY OPPORTUNITY AREAS
Immediate Deductibility of Capital Cost:

I. Tangible Capital - Canada versus U.S.

United States

Immediate Expensing – 100% immediate expensing (bonus depreciation) is available for certain business expenses including machinery and equipment and qualified improvement property acquired and placed in service after September 27, 2017. The provision applies to both new and used property. The 100% expensing is available through 2022, after which it begins phasing out by 20% per year. For example, immediate expensing is limited to 80% in 2023, 60% in 2024 and so forth until it is fully phased out in 2027.

Eligibility - The U.S. tax reform provides companies with the ability to immediately expense 100% of investments in machinery and equipment in the year the asset is placed in service, for tangible property with a Modified Accelerated Cost Recovery System (MACRS) depreciation recovery period of 20 years or less (see links for MACRS table).

To the right are the key oil and natural gas tangible asset classes in the U.S., and as seen in the Recovery Period in Years column, all key oil and natural gas tangible asset classes are below the 20-year threshold, therefore eligible for the immediate expensing provision.

Other Sectors: U.S.

<table>
<thead>
<tr>
<th>Asset Class</th>
<th>Tangible Asset Description</th>
<th>Recovery Period in years</th>
<th>Rate in Year 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>00.4</td>
<td>Industrial Steam Systems</td>
<td>15</td>
<td>100%</td>
</tr>
<tr>
<td>13</td>
<td>Offshore Drilling</td>
<td>5</td>
<td>100%</td>
</tr>
<tr>
<td>13.1</td>
<td>Oil &amp; Gas Drilling Onshore</td>
<td>5</td>
<td>100%</td>
</tr>
<tr>
<td>13.2</td>
<td>Exploration &amp; Production Onshore</td>
<td>7</td>
<td>100%</td>
</tr>
<tr>
<td>13.3</td>
<td>Petroleum Refining</td>
<td>10</td>
<td>100%</td>
</tr>
<tr>
<td>46</td>
<td>Pipeline Transportation</td>
<td>15</td>
<td>100%</td>
</tr>
<tr>
<td>49.23</td>
<td>Natural Gas Production Plant</td>
<td>7</td>
<td>100%</td>
</tr>
<tr>
<td>49.25</td>
<td>Liquefied Natural Gas Plat</td>
<td>15</td>
<td>100%</td>
</tr>
<tr>
<td>49.5</td>
<td>Waste Reduction/Recovery Plants</td>
<td>7</td>
<td>100%</td>
</tr>
</tbody>
</table>

CHART 2: (DEPRECIATION RECOVERY PERIOD OF 20 YEARS OR LESS)

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
<th>Annual Deduction Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.11</td>
<td>Office Equipment</td>
<td>100%</td>
</tr>
<tr>
<td>0.22</td>
<td>Automobiles</td>
<td>100%</td>
</tr>
<tr>
<td>0.12</td>
<td>Computers</td>
<td>100%</td>
</tr>
<tr>
<td>0.3</td>
<td>Equipment for excavating/moving earth</td>
<td>100%</td>
</tr>
<tr>
<td>0.12</td>
<td>Computer Software</td>
<td>100%</td>
</tr>
<tr>
<td>0.12</td>
<td>Data Network Infrastructure Equipment</td>
<td>100%</td>
</tr>
<tr>
<td>0.12</td>
<td>Electronic Data Processing</td>
<td>100%</td>
</tr>
<tr>
<td>30-40</td>
<td>Manufacturing and Processing Equipment</td>
<td>100%</td>
</tr>
<tr>
<td>30-40</td>
<td>Machinery/Equipment for Manufacturing</td>
<td>100%</td>
</tr>
<tr>
<td>48</td>
<td>Fibre Optic Cable</td>
<td>100%</td>
</tr>
<tr>
<td>48</td>
<td>Data Network Infrastructure Equipment</td>
<td>100%</td>
</tr>
<tr>
<td>45</td>
<td>Aircraft: fittings/equipment attached and their spare parts</td>
<td>100%</td>
</tr>
</tbody>
</table>

Comparatively, the equivalent annual deduction for most of the assets in the oil and natural gas sector in Canada is Class 41 as seen below, therefore 25% annually on a declining balance basis (subject to half year rule and availability for use rules); see other deduction rates also.

**CAPITAL COST ALLOWANCE (CCA) IN CANADA**

<table>
<thead>
<tr>
<th>Asset Class</th>
<th>Tangible Asset Description</th>
<th>Annual Rate</th>
<th>Declining Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Oil &amp; Gas Transmission Lines</td>
<td>4%</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Oil Storage Tanks</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Pumping/Compression Equipment</td>
<td>15%</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>Well and Gas Plant Equipment; Oil Sands</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>Straddle and Fractionation Plants</td>
<td>30%</td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>Pipelines</td>
<td>8%</td>
<td></td>
</tr>
</tbody>
</table>

Other intangible drilling costs (IDC’s) are 100% deductible in the year incurred for independent producers (integrated producers are at 70% deduction, with the remaining 30% written off over a 60 month period). In Canada, only unsuccessful exploration drills are deductible at the 100% rate, as all other intangible drilling costs are deductible at 30% annually.

**CANADA VS. US IN TAX TREATMENT OF INTANGIBLE CAPITAL IN OIL AND GAS**

<table>
<thead>
<tr>
<th>Asset Class</th>
<th>Description</th>
<th>Annual Deduction Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCA Class</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Office Equipment</td>
<td>20%</td>
</tr>
<tr>
<td>10.1</td>
<td>Automobiles</td>
<td>30%</td>
</tr>
<tr>
<td>10</td>
<td>Computers</td>
<td>30%</td>
</tr>
<tr>
<td>38</td>
<td>Equipment for excavating/moving earth</td>
<td>30%</td>
</tr>
<tr>
<td>12</td>
<td>Computer Software</td>
<td>100%</td>
</tr>
<tr>
<td>46</td>
<td>Data Network Infrastructure Equipment</td>
<td>30%</td>
</tr>
<tr>
<td>50</td>
<td>Electronic Data Processing</td>
<td>55%</td>
</tr>
<tr>
<td>43</td>
<td>Manufacturing and Processing Equipment</td>
<td>30%</td>
</tr>
<tr>
<td>53</td>
<td>Machinery/Equipment for Manufacturing</td>
<td>50%</td>
</tr>
<tr>
<td>42</td>
<td>Fibre Optic Cable</td>
<td>12%</td>
</tr>
<tr>
<td>46</td>
<td>Data Network Infrastructure Equipment</td>
<td>30%</td>
</tr>
<tr>
<td>9</td>
<td>Aircraft: fittings/equipment attached and their spare parts</td>
<td>25%</td>
</tr>
</tbody>
</table>

Note: the capital cost allowance for LNG facilities is a 30% annual deduction rate until 2025 (Asset Class 43) and 8% annual deduction rate thereafter (Asset Class 49).
II. Industry’s view on subsidies

- Immediate deductibility provisions defer taxes by allowing companies to pay lower current taxes, in exchange for higher future taxes.
- If immediate expensing is the only change, the total amount deducted over the life of the asset is not affected therefore do not affect the overall taxes a corporation pays in the long term, it only affects the timing of when deductions are taken.47
- Further, many reports erroneously categorize and quantify the actual tax deferral amount as the benefit to the taxpayer. This is not the case and overstates the benefit a corporate taxpayer receives.
- The main benefit to the taxpayer (cost to government) is the present value of the deferral, not the deferral amount itself, as the overall tax liability of the corporation remains the same. Immediate deductibility also represents a transfer of risk from a business to the government, as deferred taxes may never be repaid if the business fails in the future, or if the deduction is applied to other taxable income.

Federal actions to support the phase-out of inefficient oil and natural gas “subsidies”

Prior to Canada’s G20 commitment in 2009, Canada had already begun to phase out various measures available for the extraction of oil and natural gas. Examples include:

- Expiry of the Syncrude Remission order on December 31, 2003;
- Phase-out of the resource allowance (equal to 25% of a corporation’s resource profits) and phase-in of a deduction for actual royalties and mining taxes paid (Budget 2003);
- Phase-out of the accelerated capital cost allowance for tangible assets in oil sands projects (Budget 2007).

Since Canada’s commitment at the G20 Summit in 2009, this trend of removing tax measures available to the oil and natural gas sector has only accelerated. The OECD even stated in 2011 that the “Income tax treatment of the oil, gas and mining sectors in Canada has been undergoing fundamental reforms.”48 Post 2009 changes to oil and natural gas taxation include:

- Reduction in the deduction rates for intangible capital expenses in oil sands projects, to align with rates for conventional oil and natural gas therefore expenses that were previously treated as CDE, now treated as COGPE hence reduction in annual deductibility from 30% to 10% (Budget 2011);
- Reduction in the deduction rates for intangible capital expenses in oil sands projects, to align with rates for conventional oil and natural gas therefore expenses treated as CEE, now treated as CDE hence reduction in annual deductibility from 100% to 30% (Budget 2011).
- Phase-out of the Atlantic Investment Tax Credit for investments in the oil and natural gas and mining sectors, which was a 10% credit for investments in buildings, machinery, and equipment for businesses in the Atlantic and Gaspe regions (Budget 2012);
- Phase-out of the accelerated capital cost allowance for tangible assets in mines (including coal mines) (Budget 2013);
- Reduction in the deduction rate for pre-production intangible mine development expenses (including coal mines), to align with rates for the oil and natural gas sector therefore expenses previously treated as CEE, now treated as CDE hence an annual reduction in capital deductibility from 100% to 30% (Budget 2013);
- The accelerated capital cost allowance that effectively allows a 30% annual depreciation rate for equipment used in natural gas liquefaction instead of the normal rate of 8%, and a 10% rate for buildings at a facility that liquefies natural gas instead of the normal rate of 6%, will be eliminated in 2025 (Budget 2016);
- The removal of accelerated deductibility of expenses (CEE) for successful oil and gas exploratory drilling by treating them instead as CDE, hence reduction in annual deductibility from 100% to 30% (Budget 2017);
- Removal of the tax measure that allowed small oil and natural gas companies to reclassify up to $1 million in CDE as CEE when they are passed on to flow-through share investors hence reduction in annual deductibility from 100% to 30% (Budget 2017).

III. Key Elements of U.S Tax Reform

In addition to the lower federal corporate tax rate and immediate deductibility of tangible capital, the following is a brief summary of some of the other provisions that most companies consider favourable and may have been somewhat overlooked in assessing the overall positive impact of the U.S. tax reform on the competitiveness of its oil and natural gas sector.

(Note: With U.S. tax reform, upstream companies may still expense intangible drilling and development costs and similarly, for small and mid-sized domestic independent oil and natural gas producers, the percentage depletion allowance remains intact, which may continue to benefit growth and capital investment plans).

Alternative Minimum Tax (AMT)

- Many companies in the energy sector welcomed repeal of the corporate AMT as they have been either subject to AMT or have had to undergo complex computations to ensure that they are not subject to AMT.
- Another positive development is the availability of cash tax refunds of AMT credit carry-forwards between 2018 and 2021.
- Upstream companies may continue to expense intangible drilling and development costs (IDCs). Prior to the U.S. tax reform, many upstream companies were subject to AMT because IDC was a preference item, which was required to be added back as income for purposes of AMT computation.
- Thus, the repeal of AMT clearly benefits upstream companies.

Like-kind exchanges are limited to exchanges of real estate

- Under the law previous to the Tax Cuts and Jobs Act, property eligible to be exchanged in a tax-free like-kind exchange (LKE) included real property and personal property, including intangible personal property such as patents and other intellectual property.

- Under the Tax Cuts and Jobs Act, exchanges of personal property and intangible property do not qualify as tax-free under Code Sec. 1031 for exchanges completed after Dec. 31, 2017. Thus, exchanges of machinery, equipment, vehicles, patents and other intellectual property, artwork, collectibles, and other intangible business assets do not qualify for non-recognition of gain or loss as like-kind exchanges.

- For upstream companies, leasehold interests in natural resources are generally considered real property interest under section 897.

- As such, LKE is available to defer U.S. tax when oil and natural gas properties are exchanged.

Qualified business income deduction

- Under the law prior to the Tax Cuts and Jobs Act, there was no special deduction for qualified business income (QBI). The Tax Cuts and Jobs Act adds a new deduction for non-corporate taxpayers for qualified business income.

- The deduction is also referred to as the “pass-through deduction.” The deduction reduces taxable income.

- The deduction is intended to reduce the tax rate on qualified business income to a rate that is closer to the corporate tax rate.

- As such, there is potential for large tax savings for oil and natural gas business structured as partnerships, including Master Limited Partnerships (MLPs).

IV. Other Key Elements of U.S. Tax Reform

Interest Deductibility

“The ability of most taxpayers to deduct business interest will be restricted under the new legislation. Interest deductions for all taxpayers would be limited to 30% of adjusted income (ATI) but any interest disallowed may be carried forward indefinitely. In addition, the restrictions on interest, unlike the prior section 163(j) rules, are also applicable to partnerships and should be computed at that level. The 30% limitation applies to all net interest expense, not just interest paid to, or guaranteed by, a foreign-related party. The definition of ATI is nuanced, but is closely linked to earnings before interest, taxes, depreciation and amortization (EBITDA) until the year 2022, at which point ATI resembles earnings before interest and taxes (EBIT). In other words, after 2022 any deductions for depreciation, amortization, and depletion are taken into account when calculating ATI, further restricting taxpayers with large depreciation-like deductions. Despite these limitations, cross-border debt may still be beneficial as an interest expense is generally deductible when calculating the portion of shareholder distribution that is subject to withholding tax, and cross-border interest payments to a Canadian corporation often qualify for a 0% withholding tax rate.”

Loss Carry Forward

“Under prior section 172, net operating losses (NOLs) were generally eligible for a two-year carry-back and twenty-year carry-forward. Further, NOL carryovers and carry-backs could fully offset taxable income of the taxpayer if not otherwise limited under the Internal Revenue Code (e.g., section 382 limitations). Both of those rules have now changed. Application of these changes may differ from what was expected based upon the plain language of the amended statute.”

Carry-over and carry-back provisions

The amendments to section 172 disallow the carry-back of NOLs but allow for the indefinite carry-forward of those NOLs. Pursuant to section 172(e)(2) of the statute, the amended carry-back and carry-over rules apply to any NOL arising in a taxable year ending after Dec. 31, 2017.

NOL income limitation

In addition to the carryover and carry-back changes, the Act also introduces a limitation on the amount of NOLs that a corporation may deduct in a single tax year under section 172(a) equal to the lesser of the available NOL carryover or 80 percent of a taxpayer’s pre-NOL deduction taxable income (the “80-percent limitation”). Interestingly, this limitation applies only to losses arising in tax years that begin after Dec. 31, 2017 based upon section 172(e)(1) of the amended statute. As a result, taxpayers with historic NOLs (or fiscal year taxpayers projecting a current NOL) may see a silver lining around the cloud of this limitation, because for NOLs generated in tax years ending before Jan. 1, 2018, the historic rules appear applicable.

V. LRNG Modelling: Observations on certain U.S. tax reform “restrictions” Including interest deductibility and loss carry-forward

Context - Tax Sensitivity Modelling

While the broader JWG modelling considered, in part, the relative impact of the U.S. tax changes (corporate income tax rate and capital deductibility) to the competitiveness of U.S. projects, the purpose of this analysis was to test other specific U.S. tax reform items, including:

- Internal Revenue Code section 163(j) - Interest restrictions (i.e., 30% of earnings before interest and tax (“EBIT”).

- Net Operating Loss (NOL) limitation (i.e., 80% of taxable income).

This tax sensitivity analysis used a base case model for a typical U.S. Permain well that incorporated the U.S. tax rate reduction from 35% to 22% (i.e., 21% federal statutory rate plus 1% for the state of Texas), and 100% deductibility for capital expenditures.

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49 Sourced from https://www2.deloitte.com/content/dam/Deloitte/ca/Documents/tax/en_US_tax_reform_be_prepared_AODA.pdf
Conclusion

The tax sensitivity modeling results indicate a nominal negative effect on the NPV for the stand-alone project (approximately 1% change in the NPV value) when both U.S. tax reform items are considered. If the NOL restriction is isolated the NPV effect is less than 0.5%. Therefore, this analysis validates the approach taken in the lever analysis as being appropriate.

Tax sensitivity modelling assumptions used:

- Assumption - 100% debt financing equal to the total CAPEX - debt is represented as a U.S. Bond with a 3.9% annual rate of interest (source: Bloomberg U.S. yield for BBB-rated entity).
- "BFIT Net Cash Flow" is assumed to equal income for tax purposes before interest and loss deductions.
- The Internal Revenue Code section 163(j) interest restriction is based on BFIT Net Cash Flow (EBIT) to illustrate the most restrictive case (i.e., U.S. tax reform rules which apply after 2021; prior to 2022 the limitation is 30% of earnings before interest, tax, depreciation and amortization (EBITDA), which would allow a larger interest deduction).
- The U.S. rate is 22%, consistent with previous modelling and reflects a typical Permian well.

General observations and comments on tax modelling results:

- The hypothetical calculation using an extreme example of 100% debt financing for the typical well case indicates that there would only be a nominal effect on tax deductibility for interest expense, on a NPV basis. The effect of the NOL restriction in the case is even less pronounced.
- The approach to the tax sensitivity modelling was conservative as EBIT was used for the interest restriction and debt financing was assumed for all capital expended. If EBITDA was used until 2022 for the interest restriction, and/or less debt was assumed to be used for the stand-alone project financing, the effect on NPV from the two U.S. tax reform items under consideration would be even less material.
- An entity’s capital structure (debt versus equity) can change or be modified in response to market and regulatory conditions in order to ensure optimum capital efficiencies.
- Entity debt/equity levels are generally not factored in for stand-alone project analyses as debt is generally not allocated to specific projects such as the single well case models provided (i.e., the stand-alone well economics essentially reflect 100% equity financing). In addition, any interest that is limited can be carried forward indefinitely and is eventually usable.
- NOLs post U.S. tax reform do not expire, and under the going concern principle would be expected to be used in a profitable enterprise; whereas in the pre-U.S. tax reform periods NOLs expired after 20 years.
Overview

As stated in the Barton Report, “Businesses’ interactions with tax authorities influence their future investment decisions.” By virtue of recent U.S. tax reform, and the resulting 100% depreciation for tangible capital property, another substantial ancillary benefit has been bestowed upon both the taxpayer and the Internal Revenue Service (IRS) in the U.S., over and above the economic lift that investments will now be given. Recent U.S. tax reform will provide a substantial increase in ease of tax compliance and administration for the taxpayer and the IRS, thereby cutting costs for both (until this tax reform measure is phased out starting in 2023, or later if extended).

Current Challenges: Tax Disputes

Instead of the simplified treatment of expensing tangible assets as is now the case in the U.S., the wording of certain CCA class definitions for the oil and natural gas sector are complex. When combined with other compliance challenges relating to the CRA, these give rise to administrative and competitive headwinds for taxpayers.

Disputes between taxpayers and the CRA frequently arise with regard to the proper classification of capital and put an administrative and financial strain on taxpayers and the CRA, as evidenced by the increasing number of audit disputes, reassessments, objections, and tax court appeals. Capital class distinctions are a significant portion of oil and natural gas taxpayer disputes. Anecdotally most large oil and natural gas corporate taxpayers surveyed have noted at least 40% of their CRA disputes arise from CCA class issues.

Tax complexities such as this CCA example, among others, have given rise to a significantly increasing number of tax objections within the tax system. This has in turn given rise to a second issue, namely that of the challenge within the CRA to process those objections in a timely manner. The Barton Report (2017) pointed out that during tax audits, CRA demands for information are sometimes overly broad, and that there are often long delays in processing appeals, both of which have given rise to a significant backlog within the CRA.

The 2016 Fall Reports of the Auditor General of Canada on Income Tax Objections corroborates these assertions, as the total amount of tax in dispute at the objections stage (for all industries) has tripled from $6.2 billion in 2005-2006 to $18 billion in 2015-2016 (Figure 1 below). This leads to a significant amount of sterilized capital, as the law requires large corporations to pay 50% of the reassessed tax amount in dispute. Accompanying the large increase in tax revenue in dispute, the CRA inventory of outstanding objections increased 171% in that same time frame. (Figure 2).

In the year period ending March 31, 2016, the CRA reviewed 174,518 objections filed by taxpayers. Of those filed objections, 65% resulted in decisions that favored taxpayers. Of those filed objections, 65% resulted in decisions that favored taxpayers (Figure 4).

Of these favorable decisions, $6.1 billion of taxes out of a total of $11.6 billion in dispute were refunded to taxpayers, and most of the amounts claimed were allowed in full.

FIGURE 1: OUTSTANDING FEDERAL TAX DOLLARS IN DISPUTE (VALUE AT END OF FISCAL YEAR)

$ Billions

Source: Based on the Canada Revenue Agency’s data for all income tax objections in the 10-year period ending 31 March 2016

52 Ibid.
53 2016 Fall Reports of the Auditor General of Canada: Report 2: Income Tax Objections-CRA
Conclusion

Over and above the economic lift it would give to project economics, if Canada were to move to immediate deductibility for tangible capital investment benefits would also accrue to both the Canadian corporate taxpayer and the CRA. If implemented, in conjunction with other statutory reform, this measure would result in tax simplification, reduce cost of compliance for both CRA and industry, mitigate some of the challenges currently experienced in dealings between taxpayers and the CRA, and release significant capital for reinvestment in Canada.
Overview

Objectives

The analysis was undertaken by industry to inform the evaluation of potential policy levers, by building a common understanding of:

• The competitiveness gap resulting from near-term Canadian/U.S. tax and policy changes;
• The ability of potential policy levers to influence the closing of any competitiveness gap; and,
• Sector response (investment and production) to the implementation of policy lever responses to address the competitiveness gap, as well as the associated impact on the Canadian economy.

Approach

The analysis comprised the following three phases:

1. Competitiveness Gap Analysis: - the first phase of the analysis comprised detailed play level economic modeling for LRNG and generic SAGD technology economic modelling for oil sands to quantify the range of impacts on sector competitiveness resulting from policy/fiscal changes both implemented and pending in the U.S. and Canada in the near term, and to test the effectiveness of proposed levers in addressing the competitiveness gap.

2. Sector Response Analysis - the second phase of modelling assessed the sector level production/ investment forecasts associated with alternative industry growth scenarios, with the scenarios represented by:
   • Business as Usual (BAU) scenario reflecting no government policy response (beyond what is currently contemplated in regulation);
   • Growth scenario whereby government action (via the policy levers identified in the first phase of this study) is taken to address the competitiveness gap.

3. Canadian Economy Impact Analysis - building on the sector responses identified in the second phase of modelling, the final phase of analysis, General Equilibrium Modelling, was used to assess both sectoral and economy-wide impacts of the alternative policy responses.

LRNG Modelling

Key Findings

1. Industry modelling of representative play economics demonstrated a measurable competitiveness gap between Canadian and U.S. LRNG investments as a result of recent U.S. tax regime changes implemented plus the aggregate impact of incremental regulatory cost of existing and pending climate policies in Canada. The competitiveness gap between typical U.S. and Canadian LRNG investments (assuming 50% EITE protection on carbon price) is significant at approximately 7% rate of return (16% versus 9% IRR). Considered alternatively, U.S. investments provide roughly double the rates of return for a typical upstream oil and natural gas investment.

From a payout perspective, the competitiveness gap results in typical Canadian oil and natural gas investments taking an extra one to two years to achieve payout of the initial capital investment.

2. Testing the suite of policy levers identified by the JWG sub-committees demonstrates that policy action can address the competitiveness gap, thereby influencing investment decisions for Canadian LRNG opportunities. Economic modeling shows that implementing the following levers would collectively address the competitiveness gap:
   • Implementing immediate capital deductibility;
   • Targeted infrastructure enabling lowering of upstream capital costs; and
   • Providing about 80% EITE coverage protection on the aggregate cost of Canadian climate policy. In an optimistic/low compliance cost scenario (i.e. low incremental methane compliance cost as compared to certain jurisdictions, including Colorado, on new facilities and low CFS cost per tonne due to a delayed implementation schedule as well as optimistic compliance cost per tonne), analysis suggests that ~ 75 per cent EITE coverage protection on the aggregate cost of climate policy would initially be required to address the competitiveness gap. While recognizing the policy phase-in provides some initial advantage, given that there is minimal difference in extent of EITE protection recommended between the ‘optimistic’ and ‘ultimate best guess’ scenarios over time, industry believes it is reasonable and prudent (and will result in less confusion) to recommend an ongoing level of 80 per cent EITE protection on the aggregate cost of Canadian climate policy.

3. Government policy action can drive significant LRNG/LTO sector activity and investment. Compared to the BAU scenario, it is estimated that positive government action to address the competitiveness gap (Growth scenario) will result in an incremental $14 billion per year of annual investment, delivering 50% growth in Canadian natural gas production.

4. The incremental investment attributable to policy action in the Growth scenario provides material economic benefits, demonstrating importance of oil and natural gas competitiveness to the Canadian economy. General Equilibrium Modeling (GEM) shows that the incremental $14 billion per year of annual investment in LRNG / LNG / LTO sustains an increase in Canada’s real GDP of $37 billion per year on average to 2030. Furthermore, input / output analysis shows the incremental LRNG / LNG / LTO activity provides significant growth of inclusive employment opportunities for Canadians, sustaining the addition of 80,000 ongoing jobs in oil and natural gas, construction and service sectors. Government revenues are expected to increase by $7.5 billion per year on average to 2030 (total from incremental oil sands and LRNG / LNG / LTO – the relative contribution has not been quantified at this time), with $1.6 billion of that amount coming from LRNG royalties.
5. With the implementation of cost-competitive climate action on methane, and measures to support a large-scale upstream electrification program to reduce combustion emissions, modelling suggests the Growth scenario natural gas production increases of 50% could be achieved while keeping GHG emissions flat.

**Modeling Phase 1 - Competitiveness Gap Analysis**

1. **Assumptions and Methodology**

   Investment decision principles upon which the competitiveness modelling is premised include:

   - Key economic metrics typically used by industry in making investment decisions were used to assess economic competitiveness of various investment opportunities; including Internal Rate of Return (IRR, %) and Payout (in years).

   Internal rate of return remains a key indicator of overall profitability for the oil and natural gas sector. However, payout is an increasingly important metric in light of the current realities of market volatility, regulatory uncertainty, fiscal uncertainty and competitiveness relative to other jurisdictions. Investors are increasingly focused on shorter cycle investment opportunities and the timeframe necessary to recover their upfront capital investment. This is essentially a strategy to mitigate uncertainty and risk.

   - Play economics deliver an understanding of the quality of investment at the project level; the returns realized at the corporate level (see waterfall diagrams) were burdened by additional corporate costs, including G&A expenses as well as the cost of debt servicing. Typically, the corporate rate of return is approximately 10% less than the individual project rate of return.

   - While non-resource “above ground” risks to achieving the targeted return are important factors in investment decisions, for the purposes of this exercise we have not quantitatively incorporated risk into the play economics. However, it should be noted that industry believes that Canada is generally seen as having a higher “above ground” risk premium and, as we have excluded risk from the analysis, we believe the analysis is relatively conservative in nature. Key “above ground” project risks include:
     - Regulatory delays in permitting - for the typical LRNG project modelled, a year’s delay in permitting results in a loss of at least 20% of the project return; and,
     - Increased susceptibility to commodity price changes – Canada is at the “end of the pipe” and as such changes in the U.S. commodity reference price (given the fixed tolls Canadian producers are subject to deliver their products to market) have a greater relative impact on the project economics.

   - The modelling approach utilized was, for equivalent return U.S. and Canadian investments, to consider the go-forward changes to competitiveness resulting from step changes in U.S. and Canadian policy direction, namely the U.S. tax code changes and Canadian climate policy.

   The assumption of equivalent returns (as a starting point) for typical North American oil and natural gas investments is consistent with the free flow of capital and with studies that demonstrate the comparability of U.S. and Canadian LRNG/LTO investments (see Wood Mackenzie analysis below that shows relative equivalency of the mean play economics across a range of plays). The approach of assessing the incremental change of policy direction on equivalent U.S. and Canadian investments eliminates the need to consider those factors (“plus and minus”) that are effectively static that contribute to individual play economics in each jurisdiction (including royalty rates, existing state taxes, subsurface reservoir performance, etc.).

**EQUIVALENT ECONOMICS FOR NORTH AMERICAN LIQUIDS PLAYS**

*Wood Mackenzie Key Play Asset Benchmarking*

- Average economics are similar for key liquids plays across Canada & US, represented by a breakeven price of ~50$/bbl (where breakeven is the price required to achieve a 15% after-tax IRR)
- Supports the underlying assumption than an equivalent investment opportunity exists as a starting point to understand the incremental impact of go-forward policy changes.
- The distribution is also similar across plays; with the Mean at ~P60.
- Industry investment decision are based on the Mean economics.

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*Source: Wood Mackenzie*
**Pricing Assumptions (2018 Real USD & CAD)**

<table>
<thead>
<tr>
<th>FX (CAD/USD)</th>
<th>Brent (Real $/bbl)</th>
<th>WTI (Real $/bbl)</th>
<th>Edmonton Light (Real $/bbl)</th>
<th>Condensate (Real $/bbl)</th>
<th>Henry Hub (Real $/mmcf)</th>
<th>AECO Less Henry Hub (Real $/mmcf)</th>
<th>AECO (Real $/mmcf)</th>
<th>BC Gas (Real $/mmcf)</th>
<th>NGLs - 50% Discount (Real $/bbl)</th>
<th>WTI-WCS (W/O Market Access)</th>
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<td>$1.22</td>
<td>$70.00</td>
<td>$64.40</td>
<td>$60.72</td>
<td>$67.67</td>
<td>$3.09</td>
<td>-$1.55</td>
<td>$1.55</td>
<td>$1.50</td>
<td>$32.20</td>
<td>$19.00</td>
</tr>
</tbody>
</table>

- The Wood Mackenzie economic model was used to model play, or representative ‘type well,’ economics.
  - The type wells were selected to provide a representative span of project and investment grade types across key development areas in the Western Canadian Sedimentary Basin.
  - Base case economics were run on a flat price file and reflect the current fiscal and regulatory structure.
  - Model runs were made to assess the Competitiveness Gap resulting from the uplift in economics due to U.S. tax changes and the impairment of economics due to Canadian climate cost.
  - The uplift due to U.S. tax changes was developed from extensive economic modelling of U.S. projects pre- and post-tax reform. Additional analysis performed has confirmed that:
    - The U.S. drop in federal tax rate and allowance of immediate deductibility on tangible capital provide effectively all the positive economic impact resulting from U.S. tax code changes, while the changes to interest deductibility and loss carry-forward provisions have minimal effect on the project economics (see Appendix C). Conservative analysis shows collectively interest deductibility and loss carry-forward provisions result in less than 1 per cent change in project value – validating the modelling approach used, and
    - that the uplift in project economics due to U.S. federal tax changes is consistent across all U.S. jurisdictions (below).

% Change in IRR vs. Pre Tax Reform IRR

- The suite of potential policy levers identified by the sub-committees that were tested to ascertain their effectiveness at addressing the competitiveness gap (as demonstrated in the waterfall plots) are included in the table below.

**Climate Policy Assumptions**

- It is recognized that certain components of the federal climate policy are still to be finalized (including CFS design and certain aspects of EITE design) with respect to both stringency and timing of implementation. Accordingly, as provided below, as guided by discussions with ECCC officials the modeling has been developed to make reasonable assumptions regarding the likely range of final policy decisions as well as the “best guess” base assumption.

- While noting there is a range of implementation dates, for the purposes of analysis, we have considered the cost following full implementation, recognizing that investment decisions are made typically considering the longer-term cost implications.

- Key base climate policy assumptions include:
  - Carbon pricing – $50/t as of 2022 per federal backstop.
    - equates to 21 cents/mcf on produced volumes, based upon an assumed 8% fuel consumption and 0.053 t CO₂/mcf natural gas consumed.
  - Methane regulations – assumed draft Alberta regulatory system are implemented, with incremental impact estimated
at $150 million/year to LRNG sector (incremental to U.S. jurisdictions with modest methane regulations – including Texas).

- equates to 3 cents/mcf incremental to U.S. (Texas) on produced volumes as of 2020.

- **Clean Fuel Standard (CFS)** – assumed to be about $300 million/year to LRNG sector ($120/tonne on 2.5MT/year).
  - equates to 6 cents/mcf on produced volumes upon full implementation by 2030 (understanding intentions per ECCC July 2018 announcement to phase in gaseous fuel beginning in 2023.

- **Range of sensitivities tested via the “tornado chart”:**
  - **EITE protection** - recognized that as EITE protection policy is still in development there is both uncertainty and variability in assumed level of EITE across jurisdictions, for the purposes of this analysis:
    - Alberta assumed at 50% EITE, B.C. assumed at 20% EITE, federal backstop stated at 80% EITE (based on ECCC’s July 2018 announcement regarding its approach to the output-based standards under the federal pricing backstop).
  - **CFS** – considered the range of $75/t to $150/t;
    - equates to 4 cents/mcf to 7 cents/mcf on produced volumes.
  - **Methane regulations** – considered the incremental cost between Alberta regulations and U.S. jurisdictions with varying stringency;
    - equates to 1 cent/mcf incremental on produced volumes compared to jurisdictions with stringent methane regulations (i.e. Colorado).
    - equates to 4 cents/mcf incremental on produced volumes compared to jurisdictions with no / limited methane regulations (i.e. New Mexico).

- The timing of various policies was taken into consideration via analysis of competitiveness impacts and resultant EITE required over time, with the following climate policy timing assumptions informed by government announcements and/or discussions with ECCC:
  - As per criteria from the Federal Carbon Pricing Backstop, carbon pricing commences at $10 per tonne in 2018 and rises $10 per year to $50 per tonne in 2022.
  - Methane commences at 0.03$/mcf to reflect costs associated with both pneumatics (addressing existing facilities in Canada) and fugitives (LDAR). In 2021, the cost drops to 0.02$/mcf based on assumption on equivalency of requirements for new facilities that may begin to take effect in certain US jurisdictions. The methane assumptions were informed through discussions with ECCC.
  - **CFS compliance costs commence in 2023** (per announcement by ECCC in July 2018 regarding phasing of requirements by fuel type) and are assumed to phase in equally over an eight year period until full compliance required in 2030.

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**CLIMATE POLICY IMPLEMENTATION ACROSS U.S. STATES**

It is important to recognize that there are various climate policies currently implemented across the United States. Texas has limit requirements which apply in the Barnett Shale Region. Natural gas production sites are required to implement a minimum leak detection and repair program. Other states have more comprehensive strategies, statutes and regulations to directly address GHG emissions. Pennsylvania has recently put in place a broad oil and natural gas sector regulatory framework designed to reduce methane emissions from natural gas well sites, compressor stations and along pipelines. The framework establishes Best Available Technology requirements, air emission limits, source testing, leak detection and repair, record keeping, and reporting requirements. Colorado has long standing regulations to reduce methane emissions from oil and natural gas operations. Control measures include strict leak detection and repair requirements, tank venting limits, flaring and venting restrictions during well completions, and venting limits for new and existing pneumatic devices. Climate policies extend beyond operational requirements in some jurisdictions. California has a broad climate change strategy that includes carbon pricing, low carbon fuel standards, and oil and natural gas sector operational restrictions. California’s requirements include: well completions requirements; leak detection and repair; venting limits; requirements for new and existing pneumatic devices and compressors; a cap-and-trade program with GHG emissions caps, allowances and permits. There are also federal New Source Performance Standards for the oil and natural gas sector that limit volatile organic carbon emissions and result in methane emission reductions.
ECCC has noted that carbon pricing will drive technological changes, which could minimize the incremental cost of Canadian methane regulations. Further ECCC has provided the following review that helped guide the range of impact selected for methane regulations.

Discussion of Results

Running economics on a representative range of well types provides understanding of the importance of various policy lever impacts on typical LRNG investment opportunities.

A “waterfall” depiction was used to show the competitiveness gap resulting from U.S. tax changes and Canadian climate policy, as well as the incremental impact towards closing the gap provided by each of the levers. A description of a waterfall plot is provided above.

Gap analysis is based on typical resource play economics, utilizing industry type well data from Wood Mackenzie. For each of the selected plays, modelling followed these steps to generate the waterfall:

1. Base case economics are derived from cash flow modelling for the given type well, under the current royalty and fiscal regime with inputs for capital, operating costs, production, and commodity prices. The economics are measured by internal rate of return on an after-tax basis (Atax IRR).

With the inclusion of corporate costs, the average economics deliver an IRR of 13%.

2. Climate policy impact is modelled using the same base case economics but with the addition of operating cost (in $/mcf) over the life of the type well. This is calculated as the aggregate cost of three climate policies. A range of cost inputs were considered, while the waterfall example above depicts a single cost scenario. The climate policies are as follows:
   • Clean Fuel Standard (CFS).
   • Methane abatement cost.
   • Carbon pricing.
   • EITE protection is applied to carbon pricing.

In the corporate case shown, the full cost impact is based on modelling an aggregate cost of 0.30 $/mcf (0.06 $/mcf CFS, 0.03 $/mcf incremental methane cost, 0.21 $/mcf from carbon price). The 50% EITE protection case is modelled with a resultant effective carbon price of 0.11 $/mcf, such that the residual cost is 0.20 $/mcf.

The resultant change from the base case economics with the full climate cost is a decrease in 5.15% decrease IRR, or 3.4% IRR decrease with EITE applied.

3. U.S. tax uplift represents the increased return for a similar investment opportunity in the U.S. after-tax changes (including the federal rate and immediate write-off). This is calculated using a relationship derived from modelling of U.S. play economics pre- and post-tax reform.

For the average economics, the effect of tax reform on IRR is 3.1% IRR.
Representative LRNG Play Economics

Observations drawn from the modeling include:

- As measured by the after-tax rate of return, the near-term climate policy changes have the effect of decreasing base projects economics by 3 to 5% IRR (jurisdiction dependent due to differing levels of EITE protection afforded) due to climate policy costs, whereas a comparable investment in the U.S. would have seen a similar IRR uplift due to tax reform.
- On a relative basis the U.S. investment (in the absence of any government action on policy levers) provides significantly stronger / roughly double the returns (16% vs. 9%).
- The climate policy cost results in the Canadian typical LRNG investment becoming lower quality / much less attractive, providing only single digit IRR returns.

TYPICAL PLAY ECONOMICS (IRR VIEW) WATERFALL – 50% EITE PROTECTION ON CARBON PRICE ASSUMED (ALBERTA)

TYPICAL PLAY ECONOMICS (PAYOUT VIEW) WATERFALL – 50% EITE PROTECTION ON CARBON PRICE ASSUMED
• Considering the suite of policy levers available to address the competitiveness gap shows the following:
  • Immediate capital deductibility is a significant opportunity, roughly matching the impact of the U.S. tax changes.
  • Provision of immediate capital deductibility is especially important to maintain competitiveness of economically stronger plays (which pay significant amounts of early life royalties and taxes), due to the impact of upfront capital deductibility on discounted investment economics.
• A corporate tax rate reduction of 1% has minor impact, providing roughly one-tenth of the impact of immediate capital deductibility.
• A 2% capital efficiency improvement (afforded by targeted infrastructure support) provides modest impact, roughly matching the cost of methane regulations absorbed by industry.
• Sensitivity to natural gas price demonstrates the importance of addressing mid to long term market access conditions.
• Comprehensive EITE protection on the aggregate cost of climate policy is a significant opportunity.
  • The importance of EITE protection is more pronounced for the gassier LRNG wells, which comprise a significant component of the Canadian LRNG resource base.
• Closing of the competitiveness gap between U.S. and Canadian investments would result from implementing a combination of:
  • immediate capital deductibility,
  • infrastructure support (resulting in a 2% capital cost reduction), and
  • approximately 80% EITE protection on the aggregate cost of climate policy.

An alternative demonstration of the method utilized to solve for the total EITE protection required to address the competitiveness gap is provided in the following explanatory calculation:

**Competitiveness Gap** = 5.15% Aggregate Impact + 3.10% US tax uplift = 8.25%

**Remaining Gap** = 8.25% - 3.30% capital deductibility - 0.90% capital efficiency = 4.10%

\[
\% \text{ EITE Required} = \frac{4.10 \% \text{ Remaining Gap}}{5.15 \% \text{ Aggregate Climate Impact}} = 80\%
\]

As a test for how the 80% EITE protection could be achieved disaggregated across the climate policies, the following example has been laid out assuming: full industry cost exposure to the methane requirements, 100% EITE coverage specifically on CFS, remaining EITE % on carbon pricing solved for at about 90%.

**SOLVING FOR EITE REQUIRED TO ADDRESS THE REMAINING COMPETITIVENESS GAP EQUAL TO 4.1% IRR**

<table>
<thead>
<tr>
<th>Climate Policy</th>
<th>IRR Decrease</th>
<th>EITE required</th>
<th>Mitigated IRR%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Price ($50/tonne)</td>
<td>3.60%</td>
<td>85%</td>
<td>3.08%</td>
</tr>
<tr>
<td>CFS ($125/tonne)</td>
<td>1.02%</td>
<td>100%</td>
<td>1.02%</td>
</tr>
<tr>
<td>Methane ($0.03/mcf)</td>
<td>0.53%</td>
<td>0%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Aggregate Cost</td>
<td>5.15%</td>
<td>79%</td>
<td>4.10%</td>
</tr>
</tbody>
</table>

**TYPICAL LRNG PLAY ECONOMICS (IRR VIEW) WATERFALL – 50% EITE PROTECTION ON CARBON PRICE ASSUMED (ALBERTA)**
The “tornado chart” analysis shows that solution proposed above (i.e. 80% EITE protection on the aggregate cost of climate policy) has very limited sensitivity to those areas of climate policy where there remains some uncertainty (i.e. CFS cost and incremental methane cost) is limited.

- Assuming the “best case” (i.e. CFS at $75/t and methane at 1 cent/mcf incremental) would result in needing 75% EITE coverage of the aggregate climate policy cost to close the competitiveness gap.
- Assuming the “worst case” (i.e. CFS at $150/t and methane at 4 cent/mcf incremental) would result in needing 80% EITE coverage of the aggregate climate policy cost to close the competitiveness gap.
- Accordingly, it is recommended that the base / most representative case continue to be used for policy purposes.

Range of climate cost demonstrating sensitivity on the percent of EITE required:

<table>
<thead>
<tr>
<th>Cost Sensitivity</th>
<th>Remaining gap / Aggregate climate impact = % EITE required total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Case</td>
<td>3.24% / 4.34% = 75%</td>
</tr>
<tr>
<td>Average Case</td>
<td>4.10% / 5.15% = 79%</td>
</tr>
<tr>
<td>High Case</td>
<td>4.36% / 5.46% = 80%</td>
</tr>
</tbody>
</table>

Implications of Climate Policy Implementation Timing

In recognition that various policies would be implemented in a phased-in manner, consideration was provided to the policy implementation schedule and resultant EITE required to maintain competitiveness in relation to the aggregate climate cost over time. The schedule shown in the table below summarizes timing associated with various policies taking effect, and as previously noted the climate policy timing assumptions were from government announcements and/or informed through discussions with ECCC.

The analysis of EITE required over time also accounted for proposed levers that could provide economic uplift, offsetting the level of EITE required, both the Year 1 Deductibility and 2% Capital Decrease. As is shown in the table, targeted infrastructure support is assumed to have an effect in 2021 resulting in a 2% Capex Decrease.

The findings of this analysis suggest in the range of 75 to 80% EITE protection required on the aggregate climate cost to maintain competitiveness. For the years leading up to 2023 the % EITE protection required on the aggregate climate cost is 80% on average, resulting from a combination of the federal schedule for carbon pricing, assumptions on incremental methane costs, and assumed implementation of proposed competitiveness measures. Starting in 2023 when CFS is assumed to come into effect, EITE required begins at ~73% in 2023 and with full CFS phase in by 2030 reaches in the range of 76% (Case 1) to 79% (Case 2).
Modelling Phase 2 - Sector Response

Methodology and Assumptions

Investment and Resultant Production

Industry forecasting of the sectoral response was informed by the competitiveness gap analysis (Phase 1) and informed views as to the nature of industry response to changing market conditions. Annual investment projections were calculated for the two production scenarios (Growth and Business as Usual) based upon typical capital investments required to develop natural gas and liquids supply.

Emissions

Greenhouse emission forecasts were developed for each production scenario by taking into account the likely climate policy context for each scenario.

1. Growth Scenario

Production assumptions

Assumes the implementation of policy levers to address the competitiveness gap, such that activity is sustained and grows once market constraints are lifted, and results in an estimated 7 Bcf/d incremental production growth which equates to about 50% incremental growth.

- Initially, investment continues at a pace required to offset the 3 Bcf/d decline in base production, limited by the current system capacity to takeaway natural gas;
- Mid-term growth of 3 Bcf/d total incremental demand is provided by accelerating inter-Alberta (NGTL) pipeline de-bottlenecking, which enables utilization of eastern mainline excess capacity, growth in oil sands demand for natural gas, and demand for coal to natural gas power conversions in Alberta; and,
- Beginning in 2024, long-term growth is supported by multiple west coast LNG plants and grows to 4 Bcf/d of total incremental demand.
Emissions assumptions

- Fugitive methane reductions were assumed in accordance with the federally regulated backstop standards of reductions of 45% by 2025;
- Assuming extensive EITE protection on the aggregate climate policy cost, no emission reductions were associated with the federal CFS;
- Implementation of a significant upstream electrification program in B.C. and (somewhat less so) in Alberta, which is dependent on both infrastructure support as well as sufficient fiscal incentives for site-based electrification decisions.

It is recognized that assuming extensive EITE protection and a significant upstream electrification program in Western Canada may appear contradictory, however we note that there are a variety of potential tools to incent electrification and that discussions will need to be held to find the right mix of tools to incent electrification while continuing to provide a sufficient level of EITE protection to maintain sector competitiveness.

2. Business as Usual Scenario

Production assumptions

Assumes no government action (beyond currently contemplated regulatory measures) is taken to address the competitiveness gap, resulting in a relatively flat production scenario.

- Base activity levels required to fill base production decline are 30% less than the growth scenario, based on activity level modeling that considers the competitiveness gap on the economics of projects at the margin;
- The mid-term growth achieves the same incremental growth but is delayed by one year, as compared to the Growth case; and,
- Long-term growth from LNG is risked at 50% to a maximum of 2 Bcf/d, reflecting the importance of the levers to LNG competitiveness.

Emissions assumptions

- Fugitive methane reductions were assumed in accordance with the federally regulated backstop standards of reductions of 45% by 2025;
- Assumed 5% carbon intensity reduction resulting from the proposed CFS; and,
- Minimal electrification of new development would be expected to proceed, as electrification project economics require support to proceed and would not be economically viable.

ANNUAL SPENDING - LRNG/LNG & LTO

<table>
<thead>
<tr>
<th>Year</th>
<th>BAU (B)</th>
<th>Growth (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>$30</td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>$40</td>
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<td>2021</td>
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<td></td>
</tr>
<tr>
<td>2022</td>
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<tr>
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<td>2029</td>
<td>$130</td>
<td></td>
</tr>
<tr>
<td>2030</td>
<td>$140</td>
<td></td>
</tr>
</tbody>
</table>

Average annual investment:

- Growth = $55 B
- BAU = $41 B

PRODUCTION - WCSB SALES GAS
Discussion of Results

The observations derived from the sectoral response are the following:

1. Production responses vary significantly between the BAU and Growth cases.

The BAU case production is effectively flat through 2030:

- Industry investment is expected to migrate away from Canadian LRNG as early as 2019, due to lower competitiveness relative to the U.S. investment opportunities, compounded by the uncertainty in future regulatory/policy environment. The modelling suggests a 30% decrease from base levels, which equates to the investment loss associated with adding roughly 1 Bcf/d annually of new production.
- It has been suggested that staying flat is the best outcome that could be expected from no government action and downside to the BAU case exists where production could shrink as a result of missing LNG expansion windows.

2. It is estimated that government action enabling the Growth scenario will result on average, up to 2030, in an incremental $14 billion per year of incremental investment versus the BAU scenario, a 35% increase in investment. $12 billion per year comes from upstream spending, while $2 billion per year comes from downstream (LNG) spend (recognizing the two areas of spend are linked).

3. In the absence of electrification, the Growth scenario will increase emissions by some 20 MT per year. However, with the implementation of cost competitive climate action on methane, and measures to support large-scale electrification to reduce combustion emissions, the Growth scenario natural gas production increases of 50% could be achieved while keeping GHG emissions flat.
**Modelling Phase 3 - Impacts on the Canadian Economy**

**Methodology and Assumptions**

The final phase of analysis was undertaken for the purpose of understanding how the sectoral response in each of the scenarios would affect Canada’s overall economic activity and GHG emissions. For this phase, Navius Research was contracted to investigate the impacts using its gTech model, a GEM model that represents capital, labour, and goods markets.

The scope of work was defined such that gTech was configured to predict impacts on the broader Canadian economy resulting from policy action to address competitiveness in the Growth scenario, as opposed to the BAU case. Out of scope for this phase of analysis was the study of policy levers effects on investment decisions in other sectors (for example, the effect on investment due to the implementation of immediate capital deductibility on non-oil and natural gas sectors was not directly considered). Capital and production profiles from Phase 2 modelling were provided as inputs for Navius’ general equilibrium modelling, along with guidance regarding the climate policy actions that would accompany each scenario.

A GEM will typically produce smaller changes in response to shocks in the model. For example, rising prices of inputs like labour and capital in response to increased demands for those inputs, will limit overall possible growth in jobs.

**Discussion of Results**

The incremental investment attributable to policy action in the Growth scenario provides material economic benefits, demonstrating importance of oil and natural gas competitiveness to the Canadian economy. General Equilibrium Modelling (GEM) shows the incremental $20 billion per year of annual investment in LRNG, LNG, and oil sands relative to the business as usual case sustains an increase of $45.4 billion by 2030 (with incremental GDP increases before then). It is estimated that the approximately $14 billion annual incremental LNG/LRNG/LTO investment relative to the BAU case increases real GDP by about $37 billion in 2030. Furthermore, separately conducted input/output modelling shows the incremental oil and natural gas activity provides significant growth of inclusive employment opportunities for Canadians, sustaining the addition of ongoing 120,000 direct and indirect jobs on average through to 2030, with an estimated 80,000 of those due to LNG, LRNG and LTO activity. Incremental government revenues from incremental activity in LNG, LRNG, LTO and oil sands are expected to average $7.5 billion per year.

The GDP impacts of action are significant for Canadians. In 2030, real GDP is forecast by the model to be $45.4 billion higher than in the BAU case across Canada due to incremental investment in LRNG / LNG and oil sands. In the BAU case, Canada’s compound real GDP growth between 2015 and 2030 is expected to be 1.9 per cent. In the growth case, compound real GDP growth is anticipated to be 2.0 per cent, reflective of incremental spending the oil and natural gas industry. It is anticipated that approximately $37 billion of the $45.4 billion GDP increment is due to investment in LNG, LRNG and LTO.

Most of the incremental $45.4 billion in real GDP in 2030 occurs in Western Canada, due to incremental LRNG and oil sands investment. Approximately 80 per cent of the GDP growth takes place in British Columbia, Alberta, and Saskatchewan. In the growth case, compound annual GDP growth in Western Canada is 2.4 per cent, compared to 2.1 per cent in the BAU case.

The government revenues impact is also significant. Incremental government revenues from incremental activity in LRNG, LNG, and oil sands are expected to average $7.5 billion per year through 2030. Federal taxes collected are expected to average an incremental $3.1 billion per year. Incremental provincial and municipal taxes (excluding royalties) collected are expected to average $2.1 billion per year. Incremental LRNG/LTO royalties are anticipated to average $1.6 billion per year.

It was decided to use input/output analysis to estimate employment impacts based on some challenges with how the GEM model analyzes the labour market, including:

- The gTech GEM model does not allow labour supply to flow between provinces, which is not reflective of industry’s experience in attracting labour from across and outside of Western Canada in order to work on these projects;
- The gTech GEM model is a long-term equilibrium model and, as such, doesn’t consider employment capacity opportunities in situations where workers have dropped out of the workforce for extended periods (In prolonged downturns, the unemployed may become discouraged, stop looking for work, and temporarily drop out of the labour force. There is evidence of this in Western Canada due to the effects of the recent commodity price collapse experienced in the past several years.)

While the input/output model may overstate the employment opportunity, given that we have not taken into account the induced employment that is generated, we are generally comfortable with the magnitude of the employment opportunity created.

However modelled, the Canadian employment opportunity created is considerable. As noted separately in this report, the employment opportunity is material for underrepresented groups (including the indigenous community as well as rural populations and women in STEM). Further the employment opportunity provides protection from “employment shocks” to the economy, as could be experienced by other sectors of the economy as a result of external trade measures imposed on Canada.
**Oil Sands Modelling**

**Modelling Phase 1: Competitiveness Gap**

**Overview of Approach**
- Potential policy levers to improve projects economics within the oil sands sector were identified by industry. A generic 35 Mb/d facility was used to assess the impact of these policy levers on oil sands economics. All calculations were performed using the Wood Mackenzie Global Economic Model.
- The resulting policy scenarios were benchmarked against similar long cycle opportunities in the United States Gulf of Mexico using Internal Rate of Return (IRR%).
- The impact of innovation on oil sands economics was also modelled using an example of Injected Hydrocarbon Assisted (IHA) technology obtained from the Wood Mackenzie database. New technology is expected to improve Canada’s competitive position by increasing project revenues, decreasing costs and will also reduce GHG emission intensity.

**Assumptions—Pricing**
- From 2018 to 2020, current pricing dynamics are assumed to persist. Beginning in 2021, prices which are more indicative of the current forward strip have been used.
- $60 WTI is a reasonable price assumption which oil sands companies would currently use to evaluate the economics of long term projects.

**Pricing Assumptions**

<table>
<thead>
<tr>
<th></th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022+</th>
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<tbody>
<tr>
<td><strong>Common Assumptions</strong></td>
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<tr>
<td>Inflation</td>
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<td>2.0%</td>
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<td>FX (CAD / USD)</td>
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<td>1.22</td>
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<td>1.20</td>
<td>1.20</td>
</tr>
<tr>
<td>WTI</td>
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<td>64.40</td>
<td>64.40</td>
<td>60.00</td>
<td>60.00</td>
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<tr>
<td><strong>Oil Sands Assumptions</strong></td>
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<td></td>
</tr>
<tr>
<td>WTI – WCS (w/o Market Access)</td>
<td>19.00</td>
<td>19.00</td>
<td>19.00</td>
<td>19.00</td>
<td>19.00</td>
</tr>
</tbody>
</table>

**Assumptions—Innovation**
- Implementation of IHA technology will reduce energy requirements associated with in situ bitumen production. Inputs were obtained from a real-world future development contained in the Wood Mackenzie database.
- Specific benefits modelled include:
  - 25% reduction to SOR.
  - Quicker ramp up to capacity.
  - 18% increase in lifetime production of facility.
- Capital intensity of the IHA facility is assumed to increase by 5% which partially offsets the above benefits.

**Assumptions—Project Specs and Costs**
- Commercialization of IHA SAGD is expected to take place in a phased approach to reflect the gradual de-risking of the technology:
  - Conventional SAGD: existing SAGD technology
  - Partial IHA SAGD: Injected Hydrocarbon Assisted (IHA) equipment implemented at 25% of facility wells. Producers will not implement this technology at all wells to begin with because the technology will carry uncertainty. Benefit of new technology realized at 25% of facility wells.
  - Full IHA SAGD: IHA equipment implemented at 100% of facility wells. Once technology is de-risked, implementation will occur at all of the facility’s wells resulting in maximum benefit.
- The glide path to future technology is incorporated in the Phase 2 of the modelling which analyzes the sectoral response.
Immediate Deductibility

- Long term 100% immediate deductibility of capital expenses in the year they are incurred.
- Long term implementation reflects the unique capital profile of oil sands projects which incur the majority of capital costs after first oil. This recommendation is similar to class 41a which was implemented in 1996 and later repealed.

Corporate Tax Rate

- 1% decrease in corporate tax rate

Clean Fuel Standards

- Base case is $75/T
- Costs escalated at 2% inflation

Carbon Tax

- Existing carbon tax of $0.36/bbl (included in “Starting Economics” bar of the waterfall)
- Incremental carbon tax of $0.91/bbl
- Costs escalated at 2% inflation
- Uses Osum Orion as emissions proxy and assumes benchmark emissions fall by 1% after 2020

Solving competitiveness issues allows companies to proceed with staged development of steam reduction technologies such as IHA SAGD.

Pipeline capacity additions such as (TMX or KXL) that reduce market egress issues and narrows WTI - WCS differentials

Market access is assumed to decrease the WTI - WCS differential by US $5.70 versus non-market access scenario (based on Wood Mackenzie and RBC analysis). This reduction in revenue per barrel is assumed to persist for the lifetime of the project (inflation adjusted).

Assumptions—Policy Levers

Sub-committee | Policy Lever | Play Economics Sensitivity Tested
---|---|---
Business Investment Climate | Immediate Deductibility | Long term 100% immediate deductibility of capital expenses in the year they are incurred.
 | Corporate Tax Rate | 1% decrease in corporate tax rate
 | Clean Fuel Standards | Base case is $75/T
 | Carbon Tax | Existing carbon tax of $0.36/bbl (included in “Starting Economics” bar of the waterfall)
 | Technology & Innovation | Solving competitiveness issues allows companies to proceed with staged development of steam reduction technologies such as IHA SAGD.
 | Market Access | Pipeline capacity additions such as (TMX or KXL) that reduce market egress issues and narrows WTI - WCS differentials

Assumptions—Tax

- **Flow Through Taxes**: assumes the company building the project is in a taxable position and can apply the tax pools created by the initial capital outlay towards corporate income rather than income generated by the project.

- **British Depreciation**: capital is eligible for depreciation the year it is spent rather than when the asset is “put-in-use”.

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Source: CAPP and Wood Mackenzie Global Economic Model (GEM) and CAPP
Benchmarking to Gulf of Mexico (GOM) Deepwater

- Use of US Gulf of Mexico (GOM) deepwater assets as a benchmark to oil sands opportunities has a precedent in the recent Alberta Royalty review.\textsuperscript{54}

- GOM deepwater assets function as a useful comparator because they have similar characteristics to the oil sands:
  a) Both types of projects require significant capital expenditures before reaching first oil.
  b) Both types of projects deliver long-lived, steady production which translates to a predictable stream of cash flows.

- GOM opportunities identified below and included in this analysis represent the least profitable greenfield opportunities that have been marked for probable development by Wood Mackenzie.

**KEY METRICS FOR LONG CYCLE PROJECTS**

<table>
<thead>
<tr>
<th>Project</th>
<th>IRR (%)\textsuperscript{55}</th>
<th>Capital Before First Oil (Local Currency)</th>
<th>Total Production (mmboe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shenandoah (GOM)</td>
<td>14.2%</td>
<td>$2.9B</td>
<td>200</td>
</tr>
<tr>
<td>Anchor (GOM)</td>
<td>16.0%</td>
<td>$3.3B</td>
<td>503</td>
</tr>
<tr>
<td>North Platte (GOM)</td>
<td>18.7%</td>
<td>$3.2B</td>
<td>502</td>
</tr>
<tr>
<td>Generic In Situ Facility</td>
<td>See graph below</td>
<td>$1.3B</td>
<td>295</td>
</tr>
</tbody>
</table>

Source: Wood Mackenzie Global Economic Model

**Generic Facility Economics (IRR% View) – $75/tonne**

An additional IRR% waterfall has been run for a CFS scenario at $75 / T

Key Findings—Competitiveness Gap Analysis

- Comparison to long cycle opportunities in the Gulf of Mexico demonstrates an oil sands competitiveness gap, a result of recent U.S. tax regime changes plus the incremental regulatory cost of climate policies in Canada.
  - Comparison of pre-tax versus post-tax IRR% indicates existing government fiscal policy is worsening the severity of the US GOM / oil sands competitiveness gap.

- Even with market access and no incremental climate policy compliance costs project economics show that oil sands will remain competitively challenged on an IRR% basis when compared to the Gulf of Mexico.

- Policy levers required to close the competitiveness gap:
  - Implementation of immediate deductibility which allows producers to write-off 100% of capital costs in the year they are incurred.
  - No implementation of CFS. The cost of CFS—which remains uncertain to industry—on top of carbon cost exacerbates the existing competitiveness gap, adds to economic challenges, and has the potential reduce the pace of new technology implementation.

  - The potential of innovative technology to close the competitiveness gap is substantial but the oil sands is a learning by doing industry which will be unable to innovate if existing oil sands opportunities are not competitive.

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\textsuperscript{54} "Alberta’s Modernized Royalty Framework," 2017.

\textsuperscript{55} IRR not reported because it is dependent on what assumptions are used with respect to climate costs, market access, etc.
Modelling Phase 2: Sectoral Response

There is a remarkable parallel between the oil sands today and the sector twenty years ago: both stand at a cross roads in which the commercialization of an unproven new technology can alter the course of the industry and the Canadian economy. 20 years ago the technology was SAGD, today the technology is IHA SAGD which has the potential to improve project economics and reduce the environmental footprint of in situ production.56

A study similar to this one was conducted 20 years ago by the National Oil Sands Task Force (NOSTF) in which they compiled a list of recommendations which they determined was necessary for the growth of the oil sands and the commercialization of SAGD. These recommendations included.57

• Fair, predictable, timely and competitive regulation, within a framework of balanced public policy.
• New generic, competitive, and certain fiscal terms
  • Including a provision which would allow the immediate write-off of all capital.
• Sustainable development and environmental compliance.
• Equal access to specialized, competitive markets, while achieving economic supply costs in accessing these markets.

Implementation of policies adhering to this framework would replicate the fiscal environment under which SAGD was first and commercialized and represent the best way to ensure industry is able to complete the commercialization of IHA SAGD. Two development scenarios comprise our sectoral response analysis which is intended to capture industry at a cross-roads:

1. **Business as Usual (BAU) Case**: assumes market access bottlenecks persist, incremental climate costs are applied to industry, and no immediate deductibility. Tepid growth persists until 2024 as the very best oil sands opportunities are exhausted, after which production falls to zero until 2030.

2. **Growth Case**: market access issues are permanently corrected, industry is exempt from Clean Fuel Standards Regulation, and immediate deductibility allowing for the write-off of all capital in the year it is incurred is implemented. We have grounded our incremental growth estimate in history: about 1,260 Mb/d of incremental in situ capacity is added over the next 17 years which reflects historical growth in excess of forecasts from the mid-90s which can be attributed to the commercialization of SAGD technology. Under this scenario, two incremental partial upgraders are built and 100 Mb/d of incremental mining capacity is also added by 2030.

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56 Environmental footprint reduced by injecting hydrocarbons into the reservoir, thus reducing steam needs and decreasing the energy intensity associated with production.
Under the BAU case, average annual capital investment is equal to $13 billion (2018 real dollars). This is roughly in line with CAPP’s 2018 capital forecast ($12 billion) where the majority of capital spending is dedicated to sustaining activities. The Growth Case results in incremental investment of $5.2 billion per year (2018 real dollars) between 2019 and 2037. While capital investment remains at levels well below the historical highs seen in 2013/14, the trend of consistent investment decline which has occurred the past four years is reversed.

**Key Findings**

- Industry finding that immediate deductibility is one of the most significant policy levers is similar to NOTSF finding nearly 20 years ago;

- Incremental increases versus the BAU case:
  - 1260 Mb/d of in situ capacity, 100 Mb/d of mining capacity, 150 Mb/d of partial upgrading capacity by 2034
  - Investments in extra capacity are estimated to add an average of about $5.2 billion (2018, real) of incremental annual investment by 2030.

- Incremental production growth from new technology will enable oil sands producers to add significant capacity while leaving substantial room under the 100 MT policy cap for additional development beyond forecast;
  - The lower emission trajectory combined with production growth demonstrates the benefits of commercialization of new steam reduction technologies.

**Modelling Phase 3: Impacts on the Canadian Economy**

The GDP impacts arising from incremental spending of approximately $20 billion per year until 2030 — $6 billion of which are in the oil sands — are significant for Canadians. The model forecasts real GDP to be $45.4 billion of GDP by 2030 across Canada than in the BAU case. This is due to incremental investment in both LRNG and oil sands. In the BAU case, Canada’s compound real GDP growth between 2015 and 2030 is expected to be 1.9 per cent. In the growth case, compound real GDP growth is anticipated to be 2.0 per cent, significantly higher considering this is reflective of incremental spending the oil and natural gas industry alone. It is anticipated that approximately $8.5 billion of the $45.4 billion increment is due to the oil sands investment. Since the oil sands sectoral roll-up anticipates additional facilities being added out to 2037, it is highly likely that additional incremental real GDP impacts would accrue over this period (which was not modelled).

Most of the incremental $45.4 billion in real GDP in 2030 occurs in Western Canada, due to incremental LRNG and oil sands investment. Approximately $37 billion of that activity takes places in British Columbia, Alberta, and Saskatchewan. In the growth case, compound annual growth in Western Canada is 2.4 per cent, compared to 2.1 per cent in the BAU case.

The government revenues impact is also significant. The gTech model does forecast government revenues from corporate and personal income taxes as well as other taxes (sales, municipal, etc.) from economy-wide activity. Incremental government revenues from incremental economic activity in LRNG, LNG, and oil sands are expected to reach $7.5 billion per year in 2030 due to economic activity in western Canada. Federal taxes collected in Western Canada are expected to reach an incremental $3.1 billion in 2030. Incremental provincial and municipal taxes (excluding royalties) collected in Western Canada are expected to reach $2.1 billion. Incremental oil sands royalties are expected to reach $600 million by 2030, with the expectation of further growth as additional projects completed after 2030, and earlier completed projects, reach payout.

Based on how the gTech model analyzes the labour market, it was decided to use input / output modelling to estimate employment impacts. The gTech model does not allow labour supply to flow between provinces. This is not reflective of industry’s past experience in attracting labour from across and outside of Western Canada in order to work on these projects. In addition, the gTech model is a long-term equilibrium model. In prolonged downturns (like the one recently experienced in Western Canada due to the commodity price collapse), the unemployed may become discouraged, stop looking for work, and drop out of the labour force. There is evidence of this in a relatively low employment rate (which compares the number of employed people to the working age population) in Alberta and Saskatchewan provincially, as well as certain regions in British Columbia. Input / output modelling (separate from Navius’ gTech model and not carried out by them) does not assume regional labour supply restrictions or that the labour market starts in equilibrium. Its results are derived from the expenditures modelled in the sectoral roll-up phase. On average to 2030,
direct and indirect jobs created are anticipated to be approximately 120,000 for LRNG and oil sands incremental activity, with 40,000 of those jobs due to incremental oil sands activity across Canada. The incremental spending in the sectoral roll up after 2030 suggests that oil sands jobs will continue to grow post-2030.

The Canadian employment opportunity created is considerable. As noted separately in the report, the employment opportunity is material for otherwise underrepresented Indigenous peoples, given their greater prevalence in the industry’s workforce as compared to Canada’s workforce. It also provides an opportunity to create jobs for long-term unemployed workers as a result of the commodity price crash (currently, Alberta’s average unemployment duration is close to six months).

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Most of the incremental $45.4 billion in real GDP in 2030 occurs in Western Canada, due to incremental LRNG and oil sands investment. Approximately $37 billion of that activity takes places in British Columbia, Alberta, and Saskatchewan. In the growth case, compound annual growth in Western Canada is 2.4 per cent, compared to 2.1 per cent in the BAU case.

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