

# **DOUBLING DOWN WITH TAXPAYER DOLLARS:**

**FOSSIL FUEL SUBSIDIES FROM  
THE ALBERTA GOVERNMENT**



environmental  
defence



International Institute for  
Sustainable Development

# ACKNOWLEDGMENTS

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## A REPORT BY



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About **OIL CHANGE INTERNATIONAL** (priceofoil.org): Oil Change International is a research, communication, and advocacy organization focused on exposing the true costs of fossil fuels and facilitating the coming transition towards clean energy.

**Written by Environmental Defence and Philip Gass, with special thanks to Yanick Touchette**

**For Canada to fulfil its commitment to phase out inefficient fossil fuel subsidies by 2025, all provinces should also end public support for oil, gas and coal companies.**

The Alberta government provided billions of dollars in public subsidies to the province's fossil fuel industry over the last three fiscal years (FYs). Fiscal supports from Alberta taxpayers for oil, gas and coal production and consumption averaged at least \$1.6 billion per year between FYs 2015/16 and 2017/18, including over \$2 billion in the FY 2017/18 alone.

Royalty structures, tax provisions, research grants, and programs that have already been announced suggest that government subsidies valued in the billions of dollars will continue to support Alberta's fossil fuel industry until at least 2026. Without reform of these fiscal supports for the oil and gas industry, the level of public money flowing to the industry may continue to grow, even though Canada has committed to phase out inefficient fossil fuel subsidies by 2025.

Alberta has a Climate Leadership Plan that includes a price on carbon pollution, a schedule to phase out coal-fired power plants, investments in renewable energy, public transit and energy efficiency, and a cap on emissions from the oil sands. But fossil fuel subsidies work against the progress Alberta is making on climate action and encourage the growth of an industry that is already responsible for over a quarter of Canada's greenhouse gas (GHG) emissions. They siphon limited public resources away from, and create an economic disadvantage for, investments in the growing clean economy, such as renewable energy and energy efficiency. In some cases, Alberta's fiscal supports for fossil fuels are designed to reduce carbon intensity, reduce wastewater and tailings, or improve

energy or water efficiency in the oil and gas sector. While some of these supports may serve a positive environmental purpose, the provincial government must still be transparent about these public subsidies and demonstrate that they are as cost-effective as possible.

Fossil fuel subsidies encourage the expansion of carbon-intensive oil and gas projects with high up-front capital costs and long payback periods, increasing the risk of locking in GHG emissions for decades. The risk of carbon lock-in underscores the need for transparency to demonstrate that subsidizing efficiency improvements in the oil and gas sector is an optimal use of public money. Fossil fuel subsidies also increase the likelihood of Alberta oil and gas assets becoming stranded in a world that has committed to rapidly reduce GHG emissions. Just as Canada, and the world, strives to rapidly reduce demand for oil and gas in line with the Paris Agreement to limit global warming to well below two degrees Celsius and aims for 1.5 degrees, these subsidies give an unfair advantage to fossil fuel energy projects that are potentially unviable without government support.

For Canada to fulfil its commitment to phase out inefficient fossil fuel subsidies by 2025, all provinces should also end public support for oil, gas and coal companies. As the largest provincial GHG emitter in Canada, Alberta should release a public accounting of provincial fossil fuel subsidies as soon as possible and develop a roadmap for the phase-out of these subsidies in the 2019 provincial budget.



# ALBERTA'S OUTSIZED CONTRIBUTION TO CANADA'S GREENHOUSE GAS EMISSIONS

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## GREENHOUSE GAS EMISSIONS BY PROVINCE (2016)<sup>3</sup>

Alberta is Canada's primary producer of oil and gas and still burns coal to generate electricity, although the provincial government has committed to phase out coal-fired power plants by 2030. The fossil fuel industry is crucial to the province's economy and central to its identity. But Alberta is also Canada's largest emitter of GHGs, on an absolute basis and second largest on a per capita basis, largely because of the carbon-intensive production of oil and gas, in particular the oil sands. In 2016, Alberta's emissions totalled 263 megatonnes (MT),<sup>1</sup> over 37 per cent of Canada's total GHG emissions, even though it has less than 12 per cent of Canada's population and accounts for just 15 per cent of Canada's GDP.<sup>2</sup>

On a sectoral basis, the oil and gas industry, largely centred in Alberta, is responsible for 182.7 MT, or 26 per cent of Canada's total GHG emissions. From 1990 to 2016, total Canadian crude oil production increased 133 per cent. More than 90 per cent of this production growth occurred in Alberta's oil sands. Higher production levels since 2000 translated into substantial emissions growth. Over the same time period, oil sands emissions alone grew 367 per cent to 72 MT. This means that the climate impact of the oil sands subsector alone is now roughly equal to that of all other Canadian heavy industries combined.<sup>4</sup>

As Canada strives to meet its Paris agreement targets to reduce GHG emissions by

Greenhouse Gas Emissions by Province (2016)			
Province	MT CO <sub>2</sub> e	% of Canada Total	CO <sub>2</sub> e per capita (tonnes CO <sub>2</sub> e)
NL	10.8	1.5	21
PEI	1.8	0.3	13
NS	15.6	2.2	17
NB	15.3	2.2	20
QC	77.3	11	9
ON	160.6	22.8	12
MB	20.9	3	16
SK	76.3	10.8	69
<b>AB</b>	<b>262.9</b>	<b>37.3</b>	<b>65</b>
BC	60.1	8.5	13
YT	0.4	0.07	11
NT	1.6	0.2	38
NU	0.7	0.12	19
<b>Total</b>	<b>704.3</b>		

**Alberta is Canada's largest emitter of greenhouse gases on an absolute basis and second largest on a per capita basis, largely because of the carbon-intensive production of oil and gas, in particular the oil sands.**

30 per cent below 2005 levels by 2030, every region and economic sector must do its part. The Pan Canadian Framework on Clean Growth and Climate Change (PCF) provides a pathway to achieve this target through carbon pricing and climate action programs across the economy. But the gap between Canada's current GHG emissions and the emissions reductions projected in the PCF is growing.

Under the Alberta emissions cap, the PCF allows for GHG emissions growth in the oil sands of nearly 40 per cent, or approximately 28 MT,<sup>5</sup> as well as additional emissions from electricity cogeneration and new upgrading.<sup>6</sup> The Alberta government's carbon pricing system for the oil and gas industry is already tailored to account

for the industry's competitiveness concerns and allows big polluters to pay a lower price than individual Albertans and Canadians. The only other measure in the PCF to reduce GHGs from the oil and gas sector, regulations to cut methane emissions, have been delayed by three years from 2020 to 2023. And the federal government has further supported Alberta's oil and gas industry with billions of dollars in federal subsidies,<sup>7</sup> including most recently, Canada's decision to purchase the Trans Mountain pipeline and its proposed expansion, to increase the export capacity of Western Canadian oil.

# ALBERTA'S CURRENT INVENTORY OF FOSSIL FUEL SUBSIDIES

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Alberta has a long history of using government subsidies to encourage the development of its conventional and unconventional oil and gas resources.<sup>8</sup> This report focuses on direct transfers, royalty programs and fiscal policies that directly benefit oil and gas production, as well as programs and credits that further support the continued extraction, production, upgrading (turning heavy, viscous bitumen into lighter oils that are easier to refine), and consumption of oil and gas in Alberta. Some transfers and programs are designed to support innovation in the fossil fuel industry's activities, such as encouraging a reduction in the intensity of their emissions or water use, improving energy efficiency, or managing wastewater and tailings. These supports may have some environmental benefits, but they are still considered subsidies, because they are designed to support the development of oil and gas resources rather than switch to cleaner sources of energy.

Previously announced programs and budgetary measures also ensure over \$8.6 billion of public money will flow to the fossil fuel industry from Alberta taxpayers until 2026. This figure excludes royalty programs and tax deductions for exploration, development, drilling, and petrochemicals diversification that are likely to continue, as well as additional innovation and diversification grants that will likely be announced and disbursed in future years. Without reform of these fiscal supports for the oil and gas industry, the level of public money flowing to the industry may continue to grow, even though Canada has committed to phase out inefficient<sup>9</sup> fossil fuel subsidies by 2025.

**For a full year-by-year index of fossil fuel subsidies from the Alberta government, please see the Appendix.**

**In Alberta, oil, gas and coal subsidies totalled billions of dollars in provincial supports over the last three fiscal years, including at least:**

**\$1.2 BILLION IN FY 2015/16**  
**\$1.6 BILLION IN FY 2016/17**  
**\$2 BILLION IN FY 2017/18**

Royalty programs are designed to address situations where the existing oil and gas royalty regime does not appropriately reflect the unique costs of certain fossil fuel developments. Generally, these programs allow for a reduced royalty rate that companies must pay to the government compared to a sector benchmark. Through reduced rates, royalty programs encourage the exploration and development of new oil and natural gas reserves and the longevity of existing reserves.

Through these royalty adjustment programs, the Alberta government provided billions of dollars of fiscal supports to the fossil fuel industry over the last three years, largely through reduced royalty rates for natural gas deep drilling, shale gas and horizontal oil. **Royalty adjustment programs subsidized the oil and gas industry at an average of \$1.16 billion per year over the last three years.**

## Total Royalty Adjustments:

**\$851 million in 2015/16**

**\$1.18 billion in 2016/17**

**\$1.46 billion in 2017/18**

## HIGH SUBSIDIES, LOW ROYALTIES

With the provincial government funding the oil and gas industry to the tune of billions of dollars every year, Albertan taxpayers would expect a high return on their investment. But recent analyses suggest that Alberta's royalty rates are among the lowest in the world and the province is failing to save for future generations. For example, in 2017, Alberta's 30 most productive oil sands projects, which accounted for over 95 per cent of the oil produced that year, generated \$53.5 billion in revenues and \$10.14 billion in private profits, but garnered the Alberta government just \$2.37 billion in royalties.<sup>10</sup>

That means the biggest oil sands companies paid a royalty rate of just 23.37 per cent, compared to 85 per cent in Saudi Arabia, 78 per cent in Norway, 63.5 per cent in China and 58 per cent in Australia. The \$2.37 billion in royalties is even more dubious when compared to the more than \$2 billion paid in provincial subsidies to the fossil fuel industry in FY 2017/18.<sup>11</sup>

Long-term royalty data also suggest that Albertans are not getting value for money for the public dollars going to the oil and gas industry. Royalty revenue has declined 63 per cent since 2000 despite growing production. The proportion of Canadian GDP coming from oil and gas production shrank 20 per cent from 1997 to 2015. Jobs in the extraction and distribution portions of the industry have been relatively flat since 2006 and declined in 2015.<sup>12</sup> In Alberta, the effective royalty rate for oil and gas companies decreased from 19.5 per cent in 2000 to 5.1 per cent in 2017.<sup>13</sup> With low royalty rates and stagnant job creation in the oil and gas industry, it is highly questionable whether government support for fossil fuels provides long-term benefits to Albertans.

**“LEGACY” ROYALTY ADJUSTMENT PROGRAMS<sup>14</sup> (TABLE 1)**

Royalty Programs	Royalty Adjustments (CAD)			
	2015-16	2016-17	2017-18	3-year average
Natural Gas Deep Drilling	573,000,000	879,800,000	1,071,600,000	841,466,667
Shale Gas	65,800,000	142,500,000	199,900,000	136,066,667
Horizontal Oil	140,900,000	95,800,000	87,000,000	107,900,000
Incremental Ethane Extraction	25,200,000	22,400,000	63,400,000	37,000,000
Enhanced Oil Recovery	21,000,000	19,800,000	21,500,000	20,766,667
Horizontal Gas	16,400,000	14,000,000	10,300,000	13,566,667
Proprietary Waiver	3,800,000	2,600,000	2,300,000	2,900,000
Innovative Energy Technologies	4,500,000	2,900,000	300,000	2,566,667
Otherwise Flared Solution Gas	200,000	200,000	200,000	200,000
Deep Oil Exploratory Well	100,000	100,000	100,000	100,000
Coalbed Methane	20,000	20,000	7,000	15,667
<b>Total Royalty Adjustments</b>	<b>850,900,000</b>	<b>1,180,100,000</b>	<b>1,455,700,000</b>	<b>1,162,233,333</b>



# MODERNIZED ROYALTY FRAMEWORK ROYALTY PROGRAMS AND TEMPORARY ROYALTY PROGRAMS

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**Alberta has committed \$1 billion in royalty credits to encourage companies to build manufacturing facilities that turn fossil fuels into products such as plastics, fabrics and fertilizers.**

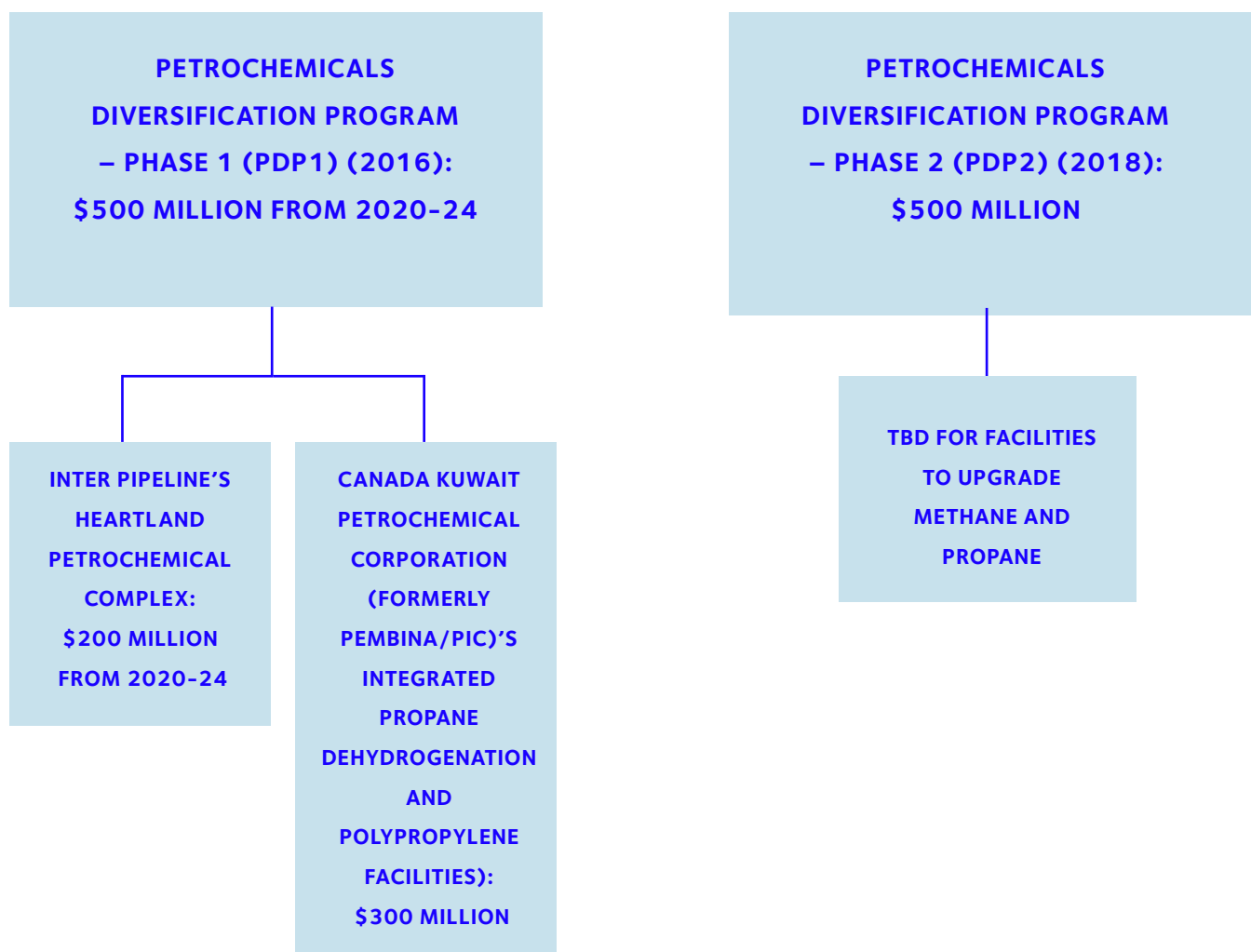
The royalty programs above are considered “legacy” because the Alberta government phased them out<sup>15</sup> and replaced them with the new Modernized Royalty Framework (MRF). In 2016, the Alberta government undertook a process to review its royalty framework to modernize and harmonize the province’s royalty strategy across all fossil fuels. The review sought to reward innovation, efficiency and low-cost producers, encourage investment, create jobs and enhance economic activity, while increasing transparency and financial reporting among oil and gas producers. The MRF replaced previous royalty programs, but largely left oil sands royalties intact. The royalty changes applied to new wells drilled after December 31, 2016.<sup>16</sup>

Out of the MRF, two new royalty programs were introduced in 2016 to promote expanded production: the Enhanced Hydrocarbon Recovery Program (EHRP) and the Emerging Resources Program (ERP). The former program is designed to increase production from existing oil and gas projects by injection of chemical solvents.<sup>17</sup> The latter is designed to encourage the industry to open up new oil and gas resources in higher-risk and higher-cost areas that have large resource potential. The Alberta government is currently reviewing industry

applications for these programs, which will result in significant royalty reductions for oil and gas projects over the next several years. While royalty adjustments for future years through the EHRP and the ERP are not yet quantifiable, the Alberta government has already committed \$1 billion in royalty credits to encourage companies to build manufacturing facilities that turn fossil fuels into products such as plastics, fabrics and fertilizers.<sup>18</sup> As part of the Petrochemicals Diversification Program, Alberta has already committed \$200 million in royalty credits to the Inter Pipeline’s Heartland Petrochemical Complex and \$300 million to the Canada Kuwait Petrochemical Corporation. Another \$500 million in royalty credits will be provided to facilities to upgrade methane and propane, upon project completion in 2020–21. While petrochemical facilities do not directly benefit from royalty credits as they do not pay royalties, the credits earned can be traded with an oil or natural gas producer. The producer can then use these credits to reduce its royalty payments to offset the cost of extracting natural gas<sup>19</sup> and oil.

The MRF programs and Petrochemicals Diversification Program ensure that at least \$1 billion in fossil fuel subsidies will be doled out by the Alberta government in the years to come.

**MODERNIZED ROYALTY FRAMEWORK ROYALTY PROGRAMS AND TEMPORARY ROYALTY PROGRAMS<sup>20</sup> (TABLE 2)**



**The design of Canada's tax system results in foregone revenue for Alberta, incentivizes producers to explore for and produce more oil and gas, and provides producers a benefit that is not available to other industries.**

The Alberta government offers hundreds of millions of dollars per year in tax exemptions and deductions for fossil fuels used in agriculture and industry, including marked fuel for off-road use, locomotive fuel, aviation fuel and propane. These subsidies encourage the continued use of these carbon-emitting fuels while disincentivizing alternatives. These subsidies totalled:

**\$308 million in FY 2015/16**  
**\$302 million in FY 2016/17**  
**\$283 million in FY 2017/18**  
**\$299 million in FYs 2018/19**

On the production side, federal tax measures, such as the Canadian Exploration Expense (CEE) and the Canadian Development Expense (CDE), results in foregone revenue for the Alberta government. These tax measures allow oil and gas companies to deduct expenses incurred from exploring for more oil and gas or developing a new oil and gas project. It is not possible to quantify these deductions on an annual basis, because companies are allowed to accumulate these expenses in "pools" for as long as the companies want.

Oil and gas producers are therefore incentivized to explore for and produce more oil and gas,

and then claim their expenses when it is most beneficial for the company to reduce its tax liability, such as when oil prices are high and profits are large. The design of the CEE and CDE underscores how the tax system is slanted in favour of oil and gas industry expansion, providing producers a benefit that is not available to other industries. It also underscores the lack of transparency in Canada's tax system that makes it difficult to quantify the level of fiscal support for fossil fuels.<sup>21</sup> It is important to note that the CEE and CDE are federal tax measures, so they are not specific Alberta fossil fuel subsidies. However, they generate provincial tax reductions, although the amount of foregone provincial revenue from these federal measures could not be quantified with the data available.

In addition to the above tax deductions specific to the oil and gas industry, Alberta offers tax credits that are available for industrial applicants more broadly, that the oil and gas industry could access. This includes the Capital Investment Tax Credit (Clean Tech Stream),<sup>22</sup> the Alberta Investor Tax Credit,<sup>23</sup> and the Scientific Research and Experimental Development Tax Credit.<sup>24</sup> It was not possible to disaggregate these tax credits by sector for this report.

**TAX EXPENDITURES<sup>25</sup> (TABLE 3)**

<b>Tax Expenditure</b>	<b>2016-17</b>	<b>2017-18</b>	<b>2018-19</b>	<b>3-year average</b>
Tax Exempt Fuel User program (marked fuel for off-road use)	210,000,000	170,000,000	188,500,000	189,500,000
Alberta Farm Fuel Benefit (marked fuel)	63,000,000	60,000,000	63,500,000	62,166,667
Reduced rate for locomotive fuel	24,000,000	23,500,000	25,000,000	24,166,667
Exemption for aviation fuel used on international flights	5,500,000	6,000,000	6,000,000	5,833,333
Provincial carbon tax exemption for clear fuel usage for on-site drilling <sup>26</sup>	-	1,500,000	1,500,000	1,500,000
Fuel tax reduced rate for propane	Not quantifiable			
Fuel tax reduced rate for aviation fuel	Not quantifiable			

**There is growing evidence that carbon capture and sequestration is not an effective method to reduce GHG emission.**

In 2011, the Alberta government agreed to commit \$745 million for the Shell Quest carbon capture and sequestration (CCS) project,<sup>27</sup> which has since been purchased by Canadian Natural Upgrading Ltd. The Quest project captures carbon emissions from an oil sands upgrader and stores it underground.

The Alberta government also committed \$1.24 billion over 15 years to develop two additional CCS projects, the Alberta Carbon Trunk Line – Enhance and North West Redwater.<sup>28</sup> As of March 31, 2017, a total of \$491 million had been paid to the two projects.<sup>29</sup> While the majority of the government's commitment has not yet been paid out to the project developer,

a large payment could come in 2018-19 when the Trunk Line begins operating.

While early assessments of the Quest CCS project suggest it is working well,<sup>30</sup> there is growing evidence that CCS is not a cost-effective method to reduce GHG emissions.<sup>31</sup> It also perpetuates the continued production and use of oil and gas, while siphoning public investment away from more sustainable alternatives.<sup>32</sup> All told, the Alberta government spent nearly \$220 million on CCS in the previous FYs and has committed to spend hundreds of millions more in the coming years.

#### CARBON CAPTURE AND SEQUESTRATION <sup>33</sup> (TABLE 4)

Programs	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
<b>Carbon Capture and Sequestration Initiative</b>	<b>159,873,000</b>	<b>30,659,000</b>	<b>50,898,000</b>	<b>272,000,000</b>	<b>71,000,000</b>	<b>58,000,000</b>
Shell Quest	149,000,000	28,000,000	28,000,000	28,000,000	28,000,000	28,000,000
Alberta Carbon Trunk Line – Enhance	4,500,000	0	TBD	TBD	TBD	TBD
Alberta Carbon Trunk Line – North West Redwater	9,900,000	0	TBD	TBD	TBD	TBD



**Often co-funded by federal grants from Sustainable Development Technology Canada or Natural Resources Canada, Alberta Innovates is funding projects to reduce freshwater use and energy intensity in oil and gas operations.**

The Alberta government consolidated its disparate innovation agencies in 2016 to create Alberta Innovates, the province's largest research and innovation agency.<sup>34</sup> Alberta Innovates supports research, innovation and entrepreneurship in health, agriculture, technology, and clean energy, including funding projects related to innovation in the oil and gas sector.

Often co-funded by federal grants from Sustainable Development Technology Canada or Natural Resources Canada, Alberta Innovates is funding projects to reduce freshwater use and energy intensity in oil and gas operations. While these projects result in reductions in GHG emissions or other types of pollution in the oil and gas industry, they are still oil and gas subsidies. The agency provided subsidies of

nearly \$3 million in FY 2016/17 and nearly \$20 million in 2017/18.

Not all subsidies are inherently inefficient, and some have public benefits (e.g. reducing freshwater use) that are worthwhile. However, the first step to determine subsidy effectiveness and efficiency is to create transparency, which is the goal of an inventory such as this one. Therefore these subsidies are included in the inventory, despite public benefits they generate. Efficient subsidies are not targeted to be removed under Canada's subsidy reform commitment, but they should still be included in an inventory to get a complete picture of public investment in the sector.

**ALBERTA INNOVATES**  
**TABLE 5A: SUSTAINABLE DEVELOPMENT TECHNOLOGY CANADA –**  
**WATER TECHNOLOGY PROJECTS (2016/17)**

Main recipient	Project	Funding
Agar Canada Corp. Ltd.	Online Water Measurement Analysis	500,000
Forward Water Technologies	Mobile Pilot-Scale Forward Osmosis Wastewater Treatment Unit	500,000
Fossil Water Corp.	Modular Treatment of Flowback & Produced Water	475,000
Ground Effects Environmental Services Inc.		500,000
Saltworks Technologies Inc.	EOR Produced Water Recycling	500,000
waterStrider Treatment Inc.	Transportable Frac Water Treatment Service	500,000

## ALBERTA INNOVATES

TABLE 5B: NATURAL RESOURCES CANADA'S OIL AND GAS CLEAN TECHNOLOGY PROGRAM (2017/18)

Main recipient	Project	Funding
<b>Natural Resources Canada's Oil and Gas Clean Technology Program</b>		9,600,000
Cenovus Energy	Solvent Driven Process Field Demonstration	2,000,000
MEG Energy	eMVAPEX	2,300,000
Field Upgrading	DSU DBM and FEED Study	971,000
Suncor Energy Oil Sands Limited Partnership	Combined Direct Contact Steam Generation and non-Aqueous Extraction Demonstration Project	N/A
Husky Oil Operations Limited	Hydrogen-Donor Diluent Reduction (HDR)	N/A
Alberta Carbon Conversion Technology Centre	Owned and operated by InnoTech Alberta, a subsidiary of Alberta Innovates	10,000,000
<b>Advanced Hydrocarbons Development Commitments <sup>35</sup></b>		8,000,000

**Emissions Reduction Alberta funding has the effect of reducing costs for the oil and gas industry, encouraging the continued production of fossil fuels, and siphoning limited public dollars away from other uses, such as investments in renewable energy.**

Emissions Reduction Alberta (ERA) is a provincial agency mandated to identify and accelerate innovative solutions that secure Alberta's success in a lower carbon economy. It previously operated as the Climate Change and Emissions Management Corporation and is a key partner in implementing the Alberta Climate Leadership Plan.<sup>36</sup> Over the last two years, ERA has provided nearly \$140 million in funding to oil and gas companies for pilot and demonstration projects that reduce emissions in oil recovery processes, such as low-energy water treatment, radio frequency enhanced oil recovery, methane reduction projects, and other oil sands innovation. Recipients of the funding have included Canada's largest oil producers, including Imperial Oil, Cenovus, Suncor, ConocoPhillips, MEG Energy and CNRL.

While ERA projects may serve a positive environmental purpose, such as improving energy and water efficiency or reducing wastewater and tailings, they still represent an allocation of public money to fossil fuel companies and projects that could be spent in

other ways. The Alberta government must be transparent and demonstrate that this is an effective and efficient use of public money. ERA funding has the effect of reducing costs for the oil and gas industry, incentivizing the continued production of fossil fuels, and siphoning limited public dollars away from other uses, such as investments in renewable energy. Even if ERA funding delivers environmental benefits and GHG reductions, it is incumbent upon the Alberta government to explain why this is the best use of government dollars during a time when transitioning to a low-carbon economy is an economic and environmental imperative.

## EMISSIONS REDUCTION ALBERTA (TABLE 6)

Main recipient	Project	2016-17	2017-2018
<b>Sustainable Development Technology Canada</b>			
Acceleware Ltd.	Radio Frequency XL (RF XL) Enhanced Oil Recovery	5,000,000	-
Calscan Energy Ltd.	Demonstration of Near Zero Emission Well Control System	982,001	-
Purlucid Treatment Solutions Inc.	Low Energy Water Treatment for Steam Assisted Heavy Oil Recovery	5,000,000	-
ERA- Reduced GHG Footprint of Fossil Fuel Supply			
Mangrove Water Technologies	Field pilot demonstration of UBC's waste-to-value innovation for conversion of carbon dioxide and desalination of wastewater in Alberta	3,000,000	-
Titanium Corporation	Reducing Methane and Other Environmental Impacts from Oil Sands Tailings and Ponds	5,000,000	-
Gentherm Global Power Technologies	Remote Generator Compressor Systems	1,785,000	-
ZKO Oilfield Industries	In-Pipe Turbine Generator Field Demonstration Project	2,844,000	-
Alphabet Energy	Power Generating Combustor to Eliminate Methane Emissions	2,150,000	-
Petroleum Technology Alliance of Canada (PTAC)	Targeted Purejet Incinerators for Methane Challenges	772,000	-
N-Solv Corporation	N-Solv BEST Oil Sands Scale-Up Project	-	25,000,000
Cenovus	Post Combustion Carbon Capture using Molten Carbonate Fuel Cell Pilot	-	15,000,000
Sub-total		15,551,000	40,000,000
<b>ERA – Oil Sands Innovation</b>			
Enlighten Innovations Inc. (Formerly Field Upgrading)	CLEANSEAS™ Demonstration Project	-	10,000,000
Imperial Oil Resources	Enhanced Bitumen Recovery Technology Pilot	-	10,000,000
Cenovus Energy Inc.	FSG Field Prototype	-	10,000,000
Suncor Energy Inc. Oil Sands	High Temperature Membranes for SAGD Produced Water Treatment	-	2,500,000
Canadian Natural Resources Limited	In-Pit Extraction Process	-	5,600,000
Cenovus Energy Inc.	Multi-Pad Pilot of a Solvent-Aided Process	-	10,000,000
ConocoPhillips Canada	Non-Condensable Gas Co-Injection for Thief Zones	-	2,500,000
Heavy Oil Solutions and Cenovus Energy Inc.	Partial Upgrader with Integrated Water Treatment	-	10,000,000
MEG Energy	eMVAPEX Pilot, Phase 3	-	10,000,000
<b>Sub-total</b>		-	<b>70,600,000</b>
<b>Total</b>		<b>26,533,001</b>	<b>110,600,000</b>



In June 2018, the Alberta government passed the Energy Diversification Act, with the objective of deriving greater value from the province's oil and gas resources and attracting investment.<sup>37</sup> The legislation allows for \$500 million in royalty credits to be given to a second round of the Petrochemicals Diversification Program.<sup>38</sup> It provides \$500 million in loan guarantees and grants to establish a Petrochemical Feedstock Infrastructure Program, which is designed to encourage companies to build new facilities to supply natural gas components for the petrochemical manufacturing industry. And it offers \$1 billion in loan guarantees and grants to initiate a Partial Upgrading Program, which is meant to encourage companies to build bitumen upgrading facilities to allow greater volumes of bitumen to be shipped through pipelines.

The province's 2018-21 fiscal plan allocated the first \$600 million of the Partial Upgrading

Program, designed to support construction of two to five partial upgrading facilities.<sup>39</sup> In November 2018, the Alberta government announced it is considering an additional six project proposals to receive funding through the program. In the same week, the province also announced it would double the amount of support for petrochemical upgrading under the Petrochemical Feedstock Infrastructure Program from \$500 million to \$1 billion, which is meant to begin handing out funding in 2021-22.<sup>40</sup> Through these programs under the Energy Diversification Act, total new provincial support for oil upgrading and petrochemicals will amount to \$2.1 billion. Contrary to the reference to "diversification" in the Act's title, this is another example of public money being used to bolster the future economic viability of Alberta's oil and gas industry, increase the export of bitumen, and continue the province's reliance on fossil fuels.

## ENERGY DIVERSIFICATION ACT PROGRAMS (TABLE 7)

Programs	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27
<b>Partial Upgrading</b>	<b>1,000,000,000</b>							
Included in Fiscal Plan 2018-2021	10,000,000	10,000,000	20,000,000	20,000,000	-	-	-	-
<b>Petrochemical Feedstock Infrastructure Program</b>	-	-	<b>1,000,000,000</b>					
Included in Fiscal Plan 2018-2021	-	-	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	-

The Northwest Redwater Sturgeon Refinery, located north of Edmonton, is a joint venture by the Alberta Petroleum Marketing Commission (APMC) and Canadian Natural Resources Limited (CNRL). It was first proposed in 2008 and was projected to cost \$4 billion.<sup>41</sup> Canada’s first new refinery in 34 years, the most recent capital cost was \$9.7 billion,<sup>42</sup> 85 per cent of which is financed by debt financing from APMC, CNRL, Northwest Refining Inc, and bonds issued through large financial institutions.<sup>43</sup> Coupled with the Red Water Trunk Line CCS project, the refinery is designed to process diluted bitumen to produce lighter petroleum products such as diesel and diluents.

Even though the refinery has not yet started processing bitumen, Albertans are already on the hook for a tolling agreement that assumes it is. The APMC has already borrowed \$432 million

from the Alberta government to lend to the Sturgeon Refinery. The provincial government anticipates that amount rising to over \$3.7 billion by 2022/23. The components of the toll include senior debt, operating costs, class A subordinated debt equity, and incentive fees.<sup>44</sup> Not all of these components are necessarily subsidies, but the large amount of public support suggests that the private sector would not have been able to shoulder the refinery project without government support. A recent report from the University of Calgary’s School of Public Policy suggests that the government consider the high risks of the project before investing in Phase 2 and 3 of the refinery’s plans.<sup>45</sup>

STURGEON REFINERY<sup>46</sup> (TABLE 8)

Programs	2018-19	2019-20	2020-21	2021-22	2022-23
Sturgeon Refinery – North West Redwater Partnership Monthly Toll Commitment	331,000,000	658,000,000	802,000,000	976,000,000	966,000,000

**Coal phase-out agreements see nearly \$100 million per year flowing to coal-fired power plant operators, beginning on July 31, 2017 and continuing until 2030.**

## COAL PHASE-OUT

As part of Alberta's Climate Leadership Plan, the province committed to phase out all pollution from coal-fired electricity by 2030, while ensuring 30 per cent of electricity will come from renewable sources by 2030. This is an important and laudable goal, with 16 per cent of Alberta's total GHG emissions coming from the electricity sector in 2014.<sup>47</sup> Alberta is also providing funding to assist municipalities affected by the coal phase-out through the Coal Community Transition Fund<sup>48</sup> and the Community Generation Fund, which includes up to \$50 million for community renewable energy projects in affected regions.<sup>49</sup> This is a welcome step that governments should emulate and expand, so that the transition away from fossil fuels ensures fairness and provides jobs and economic opportunities for communities and workers.

However, to negotiate the phase-out of coal, the Alberta government also agreed to provide transition payments to the four power companies that operate coal-fired power plants. The transition payments are being paid from revenues generated by Alberta's carbon price, but still represent a subsidy to coal-fired power producers. The payments siphon money away

from other climate action programs that carbon tax revenue can fund. Furthermore, some of the transition payments are being used to convert coal-fired plants to gas-fired plants rather than renewable energy. Coal phase-out agreements see nearly \$100 million per year flowing to coal plant operators, beginning on July 31, 2017 and continuing until 2030.

## OIL SANDS INNOVATION FUND

In December 2017, Alberta announced it would use another \$440 million in carbon tax revenue for an Oil Sands Innovation Fund. The funding is designed to help oil sands companies increase production and reduce emissions while helping producers and upgraders adjust to the province's Carbon Competitiveness Incentive Regulation, which was announced in December 2017 and applies to large emitters that produce more than 100,000 tonnes of GHG emissions per year.<sup>50</sup> The funding starts at \$40 million per year in 2019-20 and rises to \$80 million per year for the following five years.<sup>51</sup> Like other grants to improve the environmental performance of the oil sands, the Alberta government must enhance transparency and demonstrate why public money should be used to perpetuate oil and gas production rather than investing in climate solutions.

### METHANE EMISSIONS REDUCTION PROGRAM

In October 2018, Alberta announced a new program to help oil and gas facilities “identify, reduce, improve, or eliminate methane waste through energy-efficient upgrades, boosting competitiveness, productivity and environmental performance.” Oil and gas facilities that produce 40,000 barrels of oil per day or less are eligible for \$250,000 per year, per facility, through this

incentive program.<sup>52</sup> Like other grants to reduce GHG emissions from the oil and gas industry, the Methane Emission Reduction Program may provide environmental benefits, but still amounts to an economic benefit that advantages fossil fuels over alternatives. Subsidies to reduce methane emissions are particularly questionable considering recent findings that these reductions can be achieved at no net cost.<sup>53</sup>

### OTHER PROGRAMS AND PROJECTS (TABLE 9)

Programs	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Coal phase-out agreements	96,970,000	96,970,000	96,970,000	96,970,000	96,970,000	96,970,000
Oil sands innovation fund	-	-	40,000,000	80,000,000	80,000,000	80,000,000
Energy Efficiency Alberta – Methane Emissions Reduction Program	-	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000

**Alberta's plan to transport an additional 120,000 barrels per day of oil-by-rail could leave Albertans on the hook for billions more in fossil fuel subsidies.**

In November 2018, the Alberta government announced it would purchase new oil-by-rail infrastructure and equipment to enable the export of an additional 120,000 barrels per day of crude oil. The Alberta Petroleum Marketing Commission (APMC), a provincial crown corporation, is in negotiations to secure a minimum three-year contract for additional oil-by-rail capacity, including locomotives, staff and track space, rail tank cars designed for transporting crude oil, and facilities to load and unload oil trains in Alberta and elsewhere. The provincial government plans to acquire 15,000 barrels per day of oil-by-rail capacity by December 2019 and ramp up to 120,000 barrels per day by August 2020,<sup>54</sup> which could mean the purchase of as many as 7,000 rail cars and 80 locomotives.<sup>55</sup>

As of December 2018, Alberta has not disclosed the cost of this subsidy for oil-by-rail, but rail industry experts estimate the plan could cost upwards of \$1.05 billion.<sup>56</sup> A similar oil-by-rail proposal that Alberta recently pitched to the federal government was estimated at \$2.6 billion, including \$350 million for the rail capacity and the rest for operating costs over the course of three years.<sup>57</sup> The federal government appears to have rejected the proposal, saying that oil-by-rail is not a long-

term solution to the low prices being paid for Alberta oil.<sup>58</sup>

While the Alberta government claims that the additional oil-by-rail capacity will enable producers to fetch \$4 more per barrel and generate more than \$1 million per day in new federal revenues,<sup>59</sup> the plan faces a number of safety, environmental and logistical challenges. Transport Canada reports warn of weak regulations and the persistent threat of fatigue among oil-by-rail workers, highlighting the tragic 2013 oil-by-rail accident that destroyed the Quebec town of Lac-Mégantic.<sup>60</sup> Meanwhile, other industries have already raised concerns about the additional track space that would be taken up by oil trains, causing economic losses and delays for the transport of coal,<sup>61</sup> grain, lumber and minerals.<sup>62</sup> Furthermore, it will take months to manufacture and build the rail cars, locomotives and loading and unloading facilities, raising doubts about the feasibility of Alberta's plan.

Regardless of the challenges and risks of transporting more oil-by-rail, the provincial plan could mean Albertans are on the hook for billions more in fossil fuel subsidies.



**Details of Alberta's \$2 billion emergency backstop have not been made public, but does the Alberta government's offer of funding for Trans Mountain Pipeline Expansion amount to a fossil fuel subsidy?**

At the end of May 2018, the federal government announced that it would be purchasing the Trans Mountain pipeline system, including existing assets and the proposed expansion project (TMX), from Kinder Morgan for a sum of \$4.5 billion.<sup>63</sup> The purchase was approved by Kinder Morgan shareholders in August 2018.<sup>64</sup> It is estimated that the cost of building the pipeline expansion project will be \$9.3 billion,<sup>65</sup> but increased costs and delays could see that number rise even higher.<sup>66</sup> The federal government also offered to indemnify the project against delays that are “politically motivated”, while the Alberta government indicated it was willing to provide support in the form of a backstop of up to \$2 billion that would be called upon in “unforeseen circumstances.”

If Alberta's financing is needed, the province will receive equity in the completed expansion project. A spokesperson for Alberta Premier Rachel Notley noted that the \$2 billion emergency backstop is “general indemnity funding” that “would be triggered at a threshold that hasn't been disclosed yet and won't be until the sale is final.”<sup>67</sup> As of publication, the Trans Mountain Expansion project faces additional delays due to a Federal Court of Appeal ruling that overturned National Energy Board

approval of the pipeline and requires adequate consultation of Indigenous peoples and further review of the project's marine impacts.

Details of Alberta's \$2 billion emergency backstop have not been made public, but does the Alberta government's offer of funding for TMX amount to a fossil fuel subsidy? The answer is: not yet, but there is a high risk it might evolve into one over the long term. There are two central issues to determine whether there is a subsidy in this specific case. The first is indemnification and any other financial assurances. This indemnification could be classified as a subsidy since it is a direct financial benefit to the construction of the pipeline that allows it to avoid economic losses that may arise from what are referred to as “political delays.” If this is offered to a future buyer without this value being factored into the sale price, it would amount to a subsidy. The same would go for other potential financial assurances.

The second issue is the sale itself. The federal government purchased the assets for \$4.5 billion; if it sells these assets to a private buyer for an amount that is below market value (which itself would be difficult to determine) and Alberta's equity stake also does not receive

market value in the sale, this could also amount to a subsidy. The prime minister stated in September 2018 that TMX “would be dead” if the government had not purchased the pipeline and proposed expansion project.<sup>68</sup> This strongly suggests that TMX is not financially viable without public subsidies and the federal government is propping up a pipeline project that would expand the oil sands.

At this time, it is impossible to determine how big of a subsidy these elements would amount

to. Once (and if) a buyer is found and if clear terms of the sale (including the valuation of the indemnification into the sale prices) are released, it might be possible to quantify the size of the subsidy. Until that point, however, there is a high likelihood and significant concern that there will be a subsidized element of the sale, which necessitates a need for transparency around the financial aspects of the TMX purchase.

## ALBERTA GOVERNMENT SPENDS MILLIONS ON ADVERTISING FOR TMX

Alberta has spent millions of dollars on advertising to promote the Trans Mountain pipeline expansion to Canadians. The provincial government’s #KeepCanadaWorking<sup>69</sup> campaign includes paid print and radio advertisements, animated videos, shareable social media graphics, billboards,<sup>70</sup> digital “real-time lost-revenue counter” displays,<sup>71</sup> and a national survey gauging Canadians’ views of the project.<sup>72</sup> The campaign billboards in B.C. cost \$700,000.<sup>73</sup> In September 2018, a spokesperson for the Premier of Alberta said print and online news outlet ads combined are costing the provincial government around \$450,000 per week.<sup>74</sup> By October 2018, the Premier’s Office admitted the cost of the ads since April 2018 had reached nearly \$10 million.<sup>75</sup> By November 2018, Alberta’s Economic Development and Trade Minister said the government would spend \$30 million on the ad campaign.<sup>76</sup> While not a traditional subsidy that incentivizes oil and gas exploration and production, the “#KeepCanadaWorking” ad campaign represents a direct benefit to the crude oil pipeline industry.

# ALBERTA'S MASSIVE OIL AND GAS CLEAN-UP LIABILITY

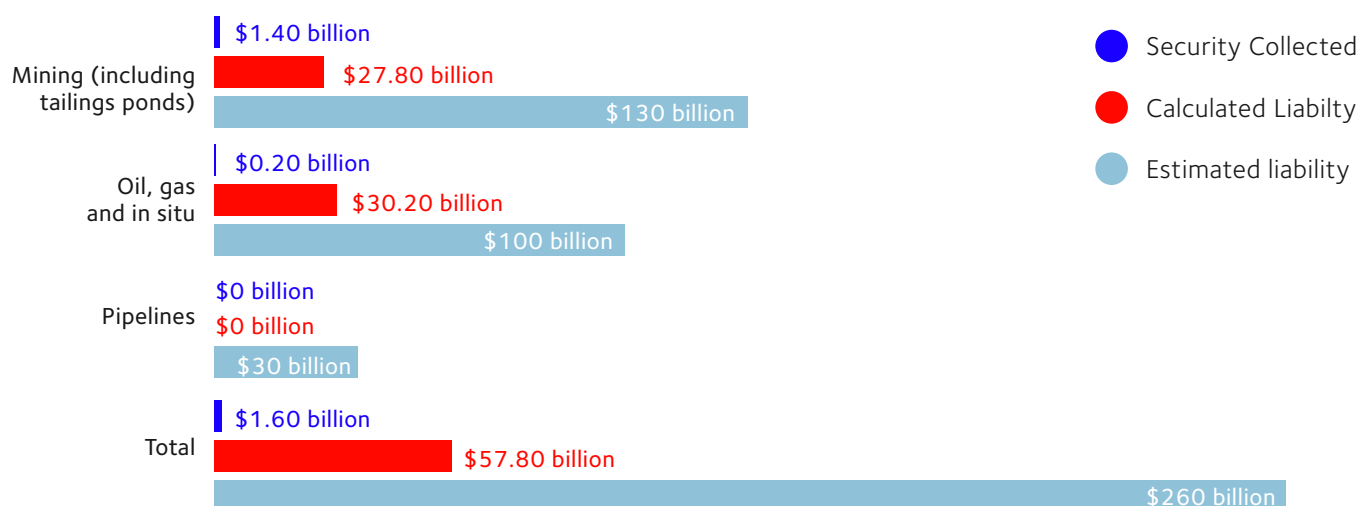
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Any discussion of the costs and benefits of Alberta's oil and gas industry would be incomplete without addressing the massive clean-up bill for old wells and tailings ponds. Oil and gas companies are legally required to clean, cap and reclaim wells, but the vast majority of wells have not been cleaned up. Hundreds of thousands of wells in Alberta need to be cleaned up now or in the coming years. With the cost of reclamation ranging from \$16,500 to millions of dollars per well,<sup>77</sup> cleaning up the province's oil and gas wells is a massive unfunded liability. Add the cost of Alberta's sprawling tailings ponds and the public liability gets even bigger. The Alberta Energy Regulator estimates that financial liabilities for cleaning up oil sands and coal mines, oil and gas wells and facilities, pipelines, and tailings ponds could cost a staggering \$260 billion.<sup>78</sup> That would mean

that the clean-up bill dwarfs the \$41.3 billion in royalties collected by the province between 1970 and 2016.<sup>79</sup> The Alberta government has only collected \$1.6 billion—or 0.6 per cent of the cost of clean-up—from the industry to cover these liabilities.<sup>80</sup>

While public money is being used to find tailings clean-up solutions, the Alberta Energy Regulator is neglecting to force companies to clean up their mess and continues to approve new tailings management plans that don't adequately explain how the ponds will be reclaimed. The combination of high-cost, carbon intensive oil and gas projects, low royalty rates and unfunded clean-up liabilities means Albertan taxpayers are subsidizing an industry that is producing far greater liabilities than profits for the province.

## ESTIMATED OIL AND GAS LIABILITIES IN ALBERTA<sup>81</sup>



# SUBSIDIZING POLLUTION: THE NEED TO REVIEW FISCAL SUPPORTS FOR FOSSIL FUELS AND PLAN FOR A JUST TRANSITION

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## The risk of asset stranding is high for Alberta's oil and gas.

Fiscal supports for fossil fuel extraction and production make oil and gas expansion more financially attractive while undermining the attractiveness and competitiveness of renewable energy alternatives. These supports fail to consider the negative externalities of increased fossil fuel production, such as clean-up liability and the growing costs of climate change. And they obscure the plummeting costs and increasing economic importance of renewables, such as wind, solar and geothermal energy. A 2017 report from Canada's Auditor General found that inefficient fossil fuel subsidies encourage wasteful consumption, undermine efforts to address climate change, and discourage investments in clean energy sources.<sup>82</sup>

Even as Alberta doles out billions to the oil and gas industry, in December 2017 the province secured the lowest renewable electricity pricing in Canada, 3.7 cents per kilowatt-hour for 600 MW of wind power.<sup>83</sup> Alberta also has the second highest solar resource in Canada, some of the best potential for wind energy, and the skilled labour force to build a powerhouse geothermal industry. The Alberta government has taken strong first steps to build a clean economy with its Climate Leadership Plan, but the pollution from the province's oil and gas industry continues to grow. Continued increases in oil and gas emissions, particularly from the oil sands, threaten to make Canada's climate commitments unachievable. Subsidies that support fossil fuels could lock in high-cost capital projects that will be incentivized to continue producing oil for decades.

Alberta has recognized that the era of coal is coming to an end and has determined the need for a phase-out of coal-fired power plants and a just transition for their workers and families. The provincial government has already begun a just transition for affected coal workers and communities with targeted supports and retraining programs. While it may be a slightly longer timeline, Alberta must recognize the fact that the oil and gas sector will need to be phased out as well.

The risk of asset stranding is high for Albertan oil and gas. Asset stranding means the loss of jobs and negative social and economic impacts for communities and workers. The same economic dynamics that are reducing GHG emissions, improving cost-competitive renewable energy, and accounting for the climate change damage from fossil fuel use, will ultimately drive the decline of the oil and gas sector. As a result, Alberta should ensure that those most dependent on the oil and gas sector are part of the planning for a just transition to a clean energy economy.

Removing provincial fiscal support for fossil fuels can remove the distortion from energy markets and prevent the creation of oil and gas projects that will become increasingly reliant on government support to remain viable. The fiscal space created by removing subsidies can be utilized to fund a just transition that takes care of workers and communities as Alberta's energy sector evolves toward a clean energy economy.

# CONCLUSION

**Canada cannot achieve its climate commitments without action by the Alberta government to plan an orderly wind-down of the oil sands, real economic diversification, and a just transition for workers and communities.**

For Canada to fulfil its commitment to phase out inefficient fossil fuel subsidies by 2025, all provinces should also end public support for oil, gas and coal companies. In particular, this includes Alberta, the centre of Canada's fossil fuel industry and the largest and fastest-growing provincial contributor to the country's greenhouse gas emissions. Canada cannot achieve its climate commitments without action by the Alberta government to plan an orderly wind-down of the oil sands, real economic diversification, and a just transition for workers and communities. Alberta can start by releasing a public accounting of provincial fossil fuel subsidies as soon as possible and developing a roadmap for the phase-out of these subsidies in the 2019 provincial budget.

The Alberta government should also answer a number of other questions about the future of its oil and gas industry in a carbon-constrained world, including:

- What is Alberta's "fair share" of greenhouse gas reductions given Canada's need to do its part to limit global warming to 1.5 degrees Celsius or less?
- How will Indigenous communities in Alberta be engaged in future oil sands expansion proposals — particularly those who live closest to, and downstream, of the mines, industrial sites and in situ extraction sites?
- How will Indigenous communities in Alberta be engaged in the reform of fossil fuel subsidies and the impact reform may have on those communities?
- Weighing further investment in bitumen extraction against other uses of public revenue, what kind of investment would create the largest number of good, ecologically sustainable jobs for Albertans?
- What is the risk to Albertans that the oil sands will become a "stranded asset," leaving taxpayers with enormous environmental cleanup costs?



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# APPENDIX: INDEX OF FOSSIL FUEL SUBSIDIES IN ALBERTA

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In Alberta, oil, gas and coal subsidies totalled billions of dollars in provincial supports over the last three fiscal years, including at least:

**\$1.2 billion in FY 2015/16 | \$1.6 billion in FY 2016/17 | \$2 billion in FY 2017/18**

Previously announced programs and budgetary measures also ensure over \$8.6 billion of public money will flow to the fossil fuel industry from Alberta taxpayers between 2019 and 2026.

## TABLE 1: LEGACY ROYALTY ADJUSTMENT PROGRAMS

Royalty Programs	Royalty Adjustments (CAD)			
	2015-16	2016-17	2017-18	3-year average
Natural Gas Deep Drilling	573,000,000	879,800,000	1,071,600,000	841,466,667
Shale Gas	65,800,000	142,500,000	199,900,000	136,066,667
Horizontal Oil	140,900,000	95,800,000	87,000,000	107,900,000
Incremental Ethane Extraction	25,200,000	22,400,000	63,400,000	37,000,000
Enhanced Oil Recovery	21,000,000	19,800,000	21,500,000	20,766,667
Horizontal Gas	16,400,000	14,000,000	10,300,000	13,566,667
Proprietary Waiver	3,800,000	2,600,000	2,300,000	2,900,000
Innovative Energy Technologies	4,500,000	2,900,000	300,000	2,566,667
Otherwise Flared Solution Gas	200,000	200,000	200,000	200,000
Deep Oil Exploratory Well	100,000	100,000	100,000	100,000
Coalbed Methane	20,000	20,000	7,000	15,667
<b>Total Royalty Adjustments</b>	<b>850,900,000</b>	<b>1,180,100,000</b>	<b>1,455,700,000</b>	<b>1,162,233,333</b>

# TABLE 2 – MODERNIZED ROYALTY FRAMEWORK ROYALTY PROGRAMS AND TEMPORARY ROYALTY PROGRAMS

Programs	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Enhanced Hydrocarbon Recovery Program		0	TBD	TBD	TBD	TBD	TBD	TBD
Emerging Resources Program		0	TBD	TBD	TBD	TBD	TBD	TBD
<b>Petrochemicals Diversification Program – Phase 1 (PDP1) (2016)</b>	-	-	-	500,000,000				-
Inter Pipeline’s Heartland Petrochemical Complex	-	-	-	200,000,000				-
Canada Kuwait Petrochemical Corporation (formerly Pembina/ PIC)’s integrated propane dehydrogenation and polypropylene facilities	-	-	-	300,000,000				-
<b>Petrochemicals Diversification Program – Phase 2 (PDP2) (2018)</b>	-	-	-	-	500,000,000			

## TABLE 3 – TAX EXPENDITURES

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Tax Expenditure	2016-17	2017-18	2018-19	3-year average
Tax Exempt Fuel User program (marked fuel for off-road use)	210,000,000	170,000,000	188,500,000	189,500,000
Alberta Farm Fuel Benefit (marked fuel)	63,000,000	60,000,000	63,500,000	62,166,667
Reduced rate for locomotive fuel	24,000,000	23,500,000	25,000,000	24,166,667
Exemption for aviation fuel used on international flights	5,500,000	6,000,000	6,000,000	5,833,333
Provincial carbon tax exemption for clear fuel usage for on-site drilling <sup>26</sup>	-	1,500,000	1,500,000	1,500,000
Fuel tax reduced rate for propane	Not quantifiable			
Fuel tax reduced rate for aviation fuel	Not quantifiable			

## TABLE 4 – CARBON CAPTURE AND SEQUESTRATION

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Programs	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
<b>Carbon Capture and Sequestration Initiative</b>	<b>159,873,000</b>	<b>30,659,000</b>	<b>50,898,000</b>	<b>272,000,000</b>	<b>71,000,000</b>	<b>58,000,000</b>
Shell Quest	149,000,000	28,000,000	28,000,000	28,000,000	28,000,000	28,000,000
Alberta Carbon Trunk Line – Enhance	4,500,000	0	TBD	TBD	TBD	TBD
Alberta Carbon Trunk Line – North West Redwater	9,900,000	0	TBD	TBD	TBD	TBD



TABLE 5A: SUSTAINABLE DEVELOPMENT TECHNOLOGY CANADA – WATER TECHNOLOGY PROJECTS (2016/17)

Main recipient	Project	Funding
Agar Canada Corp. Ltd.	Online Water Measurement Analysis	500,000
Forward Water Technologies	Mobile Pilot-Scale Forward Osmosis Wastewater Treatment Unit	500,000
Fossil Water Corp.	Modular Treatment of Flowback & Produced Water	475,000
Ground Effects Environmental Services Inc.		500,000
Saltworks Technologies Inc.	EOR Produced Water Recycling	500,000
waterStrider Treatment Inc.	Transportable Frac Water Treatment Service	500,000

TABLE 5B: NATURAL RESOURCES CANADA’S OIL AND GAS CLEAN TECHNOLOGY PROGRAM (2017/18)

Main recipient	Project	Funding
Natural Resources Canada’s Oil and Gas Clean Technology Program		9,600,000
Cenovus Energy	Solvent Driven Process Field Demonstration	2,000,000
MEG Energy	eMVAPEX	2,300,000
Field Upgrading	DSU DBM and FEED Study	971,000
Suncor Energy Oil Sands Limited Partnership	Combined Direct Contact Steam Generation and non-Aqueous Extraction Demonstration Project	N/A
Husky Oil Operations Limited	Hydrogen-Donor Diluent Reduction (HDR)	N/A
Alberta Carbon Conversion Technology Centre	Owned and operated by InnoTech Alberta, a subsidiary of Alberta Innovates	10,000,000
Advanced Hydrocarbons Development Commitments <sup>35</sup>		8,000,000

Main recipient	Project	2016-17	2017-2018
<b>Sustainable Development Technology Canada</b>			
Acceleware Ltd.	Radio Frequency XL (RF XL) Enhanced Oil Recovery	5,000,000	-
Calscan Energy Ltd.	Demonstration of Near Zero Emission Well Control System	982,001	-
Purlucid Treatment Solutions Inc.	Low Energy Water Treatment for Steam Assisted Heavy Oil Recovery	5,000,000	-
ERA- Reduced GHG Footprint of Fossil Fuel Supply			
Mangrove Water Technologies	Field pilot demonstration of UBC's waste-to-value innovation for conversion of carbon dioxide and desalination of wastewater in Alberta	3,000,000	-
Titanium Corporation	Reducing Methane and Other Environmental Impacts from Oil Sands Tailings and Ponds	5,000,000	-
Gentherm Global Power Technologies	Remote Generator Compressor Systems	1,785,000	-
ZKO Oilfield Industries	In-Pipe Turbine Generator Field Demonstration Project	2,844,000	-
Alphabet Energy	Power Generating Combustor to Eliminate Methane Emissions	2,150,000	-
Petroleum Technology Alliance of Canada (PTAC)	Targeted Purejet Incinerators for Methane Challenges	772,000	-
N-Solv Corporation	N-Solv BEST Oil Sands Scale-Up Project	-	25,000,000
Cenovus	Post Combustion Carbon Capture using Molten Carbonate Fuel Cell Pilot	-	15,000,000
<b>Sub-total</b>		<b>15,551,000</b>	<b>40,000,000</b>
<b>ERA – Oil Sands Innovation</b>			
Enlighten Innovations Inc. (Formerly Field Upgrading)	CLEANSEAS™ Demonstration Project	-	10,000,000
Imperial Oil Resources	Enhanced Bitumen Recovery Technology Pilot	-	10,000,000
Cenovus Energy Inc.	FSG Field Prototype	-	10,000,000
Suncor Energy Inc. Oil Sands	High Temperature Membranes for SAGD Produced Water Treatment	-	2,500,000
Canadian Natural Resources Limited	In-Pit Extraction Process	-	5,600,000
Cenovus Energy Inc.	Multi-Pad Pilot of a Solvent-Aided Process	-	10,000,000
ConocoPhillips Canada	Non-Condensable Gas Co-Injection for Thief Zones	-	2,500,000
Heavy Oil Solutions and Cenovus Energy Inc.	Partial Upgrader with Integrated Water Treatment	-	10,000,000
MEG Energy	eMVAPEX Pilot, Phase 3	-	10,000,000
<b>Sub-total</b>		<b>-</b>	<b>70,600,000</b>
<b>Total</b>		<b>26,533,001</b>	<b>110,600,000</b>

TABLE 7 – ENERGY DIVERSIFICATION ACT  
(2018) PROGRAMS

Programs	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27
Partial Upgrading	1,000,000,000							
Included in Fiscal Plan 2018-2021	10,000,000	10,000,000	20,000,000	20,000,000	-	-	-	-
Petrochemical Feedstock Infrastructure Program	-	-	1,000,000,000					
Included in Fiscal Plan 2018-2021	-	-	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	-

## TABLE 8 - STURGEON REFINERY

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Programs	2018-19	2019-20	2020-21	2021-22	2022-23
Sturgeon Refinery – North West Redwater Partnership Monthly Toll Commitment	331,000,000	658,000,000	802,000,000	976,000,000	966,000,000

## TABLE 9 – OTHER PROGRAMS AND PROJECTS

Programs	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Coal phase-out agreements	96,970,000	96,970,000	96,970,000	96,970,000	96,970,000	96,970,000
Oil sands innovation fund	-	-	40,000,000	80,000,000	80,000,000	80,000,000
Energy Efficiency Alberta – Methane Emissions Reduction Program	-	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000



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