New Frontiers

A Guide to Alberta's New Energy and Economic Power

JANUARY 2026

environmental defence

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Land Acknowledgement

In the spirit of respect, reciprocity and truth, Environmental Defence Canada honours and acknowledges Chuwapchipchiyan Kudi Bi (the area now known as Canmore, Alberta) and the traditional Treaty 7 territory, as well as the oral practices of the Blackfoot confederacy: Siksika, Kainai, Piikani, Stoney Nakoda Nations: Chiniki, Bearspaw, Goodstoney and Tsuut'ina Nation.

Report Acknowledgments

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About Environmental Defence

Environmental Defence is a leading Canadian advocacy organization that works with governments, industry, and individuals to defend clean water, a safe climate, and healthy communities.

Forward

Ernest Hemingway wrote in *The Sun Also Rises* that a man goes bankrupt two ways, "gradually and then suddenly." I expect that the energy transition, in Alberta, in Canada, and globally will happen the same way. Predictable and conventional economic growth and decline patterns will be maintained for a period of time — maybe for the next 10 or even 15 years — and then things will change suddenly, possibly with significant disruption to economies and societies, if they haven't prepared.[1]

Who would have predicted, 20 years ago, that China would be leading the world in renewable energy deployment, manufacturing, and export of renewable energy hardware, such as battery storage, solar panels, wind turbines, and whole economy electrification. According to a September 2025 report by the research firm Ember, "China's clean energy transition is fundamentally reshaping the economics of energy across the world. Accelerating deployment of renewables, grids and storage in China, combined with electrification of transport, buildings and industry, are rapidly bringing China itself towards a peak in energy-related fossil fuel use, while also reducing costs and accelerating uptake of clean electro-technologies in other countries. These twin trends are creating the conditions for energy-related fossil fuel use globally to peak and decline."[2]

China is transitioning from the world's largest consumer of fossil fuels, and its worst polluter, to a clean energy superpower, and they are doing it faster than anybody thought possible. They have done this in just **15 years**, having started in earnest in 2010.

China is not alone. According to the World Economic Forum, "In 2024, a notable 28% of nations, including Kuwait, Nigeria, Bangladesh, Mozambique and Tanzania, are actively transitioning towards a more balanced energy system."[3] There are several dozen others who are aspiring to join this growing list.[4]

If China, Kuwait, and Nigeria can do it, so can Canada, and more on point, so can Alberta.

Long a laggard on meeting climate change goals, and a hold out against energy transition and whole economy electrification, Alberta has a narrow window of

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1 Earnest Hemingway, The Sun Also Rises, reproduced in Goodreads. https://www.goodreads.com/quotes/102579-how-did-you-go-bankrupt-two-ways-gradually-then-suddenly

2 Ember, China Energy Transition Review 2025, https://ember-energy.org/latest-insights/china-energy-transition-review-2025/#executive-summary

3 World Economic Forum, 2024 Fostering Effective Energy Transition, https://www.weforum.org/publications/fostering-effective-energy-transition-2024/in-full/2-1-transition-scores/

4 Ibid

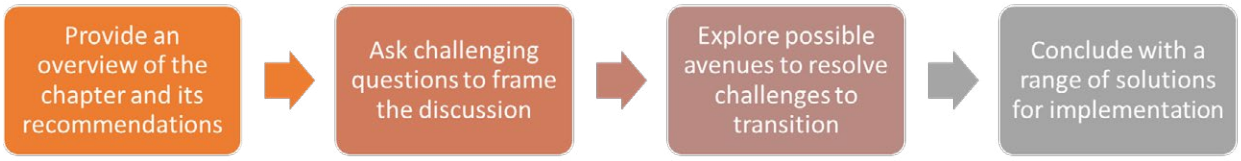
opportunity to join much of the rest of the world in transforming its economy from one dependent on the carbon-intensive vagrancies of the oil and gas market to one where we produce the energy, products and services that fuel the global economic transformation.

New Frontiers A Guide to Alberta's New Energy and Economic Power is a resource that seeks to provide policy decision makers, civil society leaders, the clean-economy industry, and future-looking concerned citizens with questions to ask, and resources to address, about what may be the most important challenge of our time: how to curb greenhouse gas emissions without causing unnecessary hardship to our economy, culture, ecology and society.

Environmental Defence Canada undertook this project to inspire a belief that if we ask the hard questions, and think creatively rather than simply in a straight line leading back, as always, to fossil fuels, that we could begin a serious political and policy discussion about *how* — not *if* — Alberta can join the global energy transition.

New Frontiers is filled with charts and graphs and numbers gleaned from hundreds of reports published on the energy transition. It is not, however, a definitive road map to transition. That is a role for the Alberta government to lead, and for all of the province's communities to participate in. The numbers found throughout this report, and many of the examples are offered as a way of demonstrating this can be done, and not necessarily, how it can be done.

New Frontiers is intended to serve as a **guide to questions** we need to ask as a province to fulfill Alberta's promise of remaining a prosperous, ecologically rich, energy-producing province within Canada. Each chapter provides avenues for probing questions, discussion, debate, and deliberation necessary to accelerate the shift from being a province preoccupied with the wealth of the past to a new, dynamic frontier. Each chapter will:



New Frontiers isn't a document with all the answers. Instead, it seeks to provide leaders in government, industry, and civil society with examples of questions and solutions that can provide direction for addressing the energy transition.

The following report addresses the questions **can we do this?** and **what should we consider?** While there are numerous suggestions throughout, they should be considered guidance rather than definitive prescriptions. Budget estimates and

timelines are provided as examples and are rough estimates derived from publicly available reports and online materials.

How it can be done is up to the myriad of passionate and thoughtful people who make up Alberta's broad energy-related community.

But, we have to start now. We should have started twenty years ago, but we've been slow to shift from our one-hundred-year love affair with oil and gas, so now time is running out for Alberta to join the transition. It's not too late.

Executive Summary

Alberta stands at a pivotal moment in its economic history. The province must transition from a disproportionate dependence on oil and gas revenues — which will decline with lessening global demand over the next decade — toward a more diversified, sustainable economy built on renewable energy, innovation, and the development of new strategic sectors such as manufacturing and clean energy construction. This transformation represents both an urgent necessity, and an unprecedented opportunity, to establish Alberta as a serious player in the clean energy economy while maintaining prosperity for current and future generations.

Chapter Overview

Chapter 1: Embracing New Frontiers establishes the framework for understanding Alberta's economic transition challenge. The chapter defines the dual pathways Alberta must pursue: transforming its domestic energy systems from fossil fuel dependence to renewable sources, and diversifying the provincial economy beyond oil and gas revenues. It outlines the research methodology and core principles underlying the transformation strategy, while pointing out false solutions, such as hydrogen and carbon capture, that distract from proven renewable technologies.

Chapter 2: The Case for Energy Transition presents compelling evidence for immediate economic diversification. Alberta oil exports face three critical disadvantages: high carbon content, inconsistent breakeven costs, ranging from $34 for oil sands crude, to $80 for new greenfield SAGD (steam-assisted gravity drainage)[5] , and a dangerous dependence on U.S. export markets.[6] The chapter examines the projected decline in global demand for Alberta's oil products while highlighting successful renewable energy transitions in New Mexico, the European Union, and China. It demonstrates how Alberta's proven capacity for rapid energy transformation –evidenced by completing the coal phase-out six years ahead of schedule — provides the foundation for renewable energy leadership.

Chapter 3: Indigenous and Métis Leadership recognizes Indigenous communities as vital partners in Alberta's energy transition. Indigenous and Métis nations currently partner in nearly 20 per cent of Canada's electricity-generating infrastructure, with Alberta communities leading innovative projects, such as the Otipemisiwak Métis Government's Salay Prayzaan Solar Project. The chapter outlines comprehensive support strategies, including enhanced financial mechanisms, capacity-building programs, and meaningful partnership frameworks. Success requires removing

[5] Canadian Energy Centre, Canadian upstream oil sector supply costs continue to decline Weighted average breakeven oil price for the Canadian oil sands sector has fallen 41% since 2015, https://www.canadianenergycentre.ca/canadian-upstream-oil-sector-supply-costs-continue-to-decline/

[6] https://www.cbc.ca/news/canada/calgary/trump-us-tariff-oil-energy-sector-differential-wcs-wti-1.7445512.

regulatory barriers, expanding loan guarantees, and ensuring Indigenous participation in all significant renewable energy developments.

Chapter 4: Industrial Policy Transformation addresses Alberta's structural economic weakness by proposing strategic diversification beyond oil and gas. The chapter presents a framework for reducing fossil fuel revenue dependence in the Alberta provincial budget from 25 per cent today to one per cent by 2050 while growing five key economic sectors. Learning from Norway's successful management of its sovereign wealth fund, it proposes a Heritage Premium levy on oil profits and comprehensive investment strategies. The analysis shows how strategic economic diversification can generate $50 billion in operating capital annually in Heritage Fund dividends by 2060, providing sustainable funding for public services and economic development.[7]

Chapter 5: A Deep Dive into "The Core Five" provides a **hypothetical** analysis of the five sectors positioned to drive Alberta's economic transformation. These five sectors — housing and rental services, manufacturing, construction, healthcare and, professional services could expand from roughly 35% of the provinces GDP to around 50% over the next twenty-five years. Proper regulation and planning would be needed to ensure that these economic engines didn't create more harm in instability than the oil and gas currently does, and strong investment incentives would be required to help these — and/or other sectors to reach their potential. The purpose of this chapter is to demonstrate that revenue and GDP diversification **can** be done, not necessarily **how** it can be done.

Chapter 6: Electrification outlines three scenarios for achieving 90-95 per cent renewable electricity by 2050.[8] The Conservative scenario requires $195-245 billion over 30 years, the Moderate scenario demands $285-345 billion over 25 years, and the Aggressive scenario necessitates $365-425 billion over 20 years. Each pathway is expected to create hundreds of thousands of jobs while delivering substantial household savings of $320-$ 480 (in 2025 dollars), or roughly 25 per cent of the average household energy bill — annually by 2050. The chapter emphasizes that private investors will finance two-thirds of the required capital expenditure, with public investment focused on rebates, incentives, and infrastructure enabling private sector success. Costs in this chapter are estimates.

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7 According to the Government of Alberta, "Alberta's Heritage Fund, also known as the Heritage Savings Trust Fund, is a long-term savings fund established in 1976 to invest a portion of the province's non-renewable resource revenue. Its objectives are to strengthen and diversify the economy, invest in projects that improve life in Alberta, and save money for future generations after non-renewable resources are depleted. As of March 31, 2025, the fund had a value of $27.2 billion and a government goal to grow it to $250 billion by 2050" https://www.alberta.ca/heritage-savings-trust-fund.

8 Canada's goal is to achieve Net-Zero carbon emissions by 2050. https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/net-zero-emissions-2050.html

Chapter 7: Alberta Energy Efficiency presents a comprehensive plan to achieve a 25 per cent reduction in energy consumption across all economic and consumer sectors within 8-25 years. Despite being Canada's energy powerhouse, Alberta ranks last among all provinces in energy efficiency. The strategy offers three implementation scenarios that require an investment of $25-45 billion but generate annual savings of $3.75-11.25 billion once implemented. The program can create 50,000-100,000 person-years of employment while reducing greenhouse gas emissions by 25-40 megatonnes annually, positioning Alberta as a leader in efficiency rather than a laggard.

Chapter 8: Alberta Workforce Transition tackles the human dimension of economic transformation through a comprehensive 25-year plan to transition 135,000 oil and gas workers to new careers. The strategy requires $14.4 billion investment but ensures no worker faces unemployment without alternatives through guaranteed reemployment programs, comprehensive retraining, and early retirement options for older workers. Many oil and gas skills can be directly transferred to renewable energy roles, with 60 per cent of workers requiring minimal additional training. The program *could* create up to 419,000 clean energy jobs by 2050, according to a report by Clean Energy Canada, significantly exceeding projected job losses in the fossil fuel sector.[9]

Chapter 9: Critical Minerals in Alberta explores the role the emerging mining sector can play in boosting Alberta's GDP, non-renewable resource revenue and secure options for workers transitioning from oil and gas to other industries. Despite Canada and Alberta having less than five per cent of the world's critical minerals, such as Lithium, the development of these important commodities can play an essential role generating economic activity and jobs during the energy transition. Alberta possesses modest geological potential for critical minerals and rare earth elements (REEs), including lithium, nickel, cobalt, helium, and graphite.[10] The Alberta Energy Transition Study highlights the economic potential, projecting the creation of 170,000 cleantech sector jobs and a contribution of $61 billion to GDP by 2050. This industrial activity, however, has to meet the highest standards for inclusion, social responsibility and environmental care.

Chapter 10: Growing Agriculture's Role demonstrates how agricultural transformation can triple the sector's GDP contribution from $10.3 billion to $31 billion while creating 150,000 new jobs. The strategy encompasses equipment electrification, value-added processing expansion, and controlled environment agriculture development, requiring $47 billion investment over 25 years. Agricultural electrification offers unique advantages through the elimination of direct greenhouse gas emissions coupled with opportunities for carbon sequestration. The sector can generate $558 billion in cumulative returns over 25 years, delivering an 11.9x return on investment while reducing emissions by 35 per cent.

9 https://cleanenergycanada.org/wp-content/uploads/2023/03/A-Pivotal-Moment-Report.pdf

10 Energy Regulator of Alberta, https://ags.aer.ca/our-science/mineral-resources/critical-minerals-potential

Chapter 11: Alberta's Mid-Transition Guide provides implementation guidance for managing Alberta's mid-transition period spanning 2025-2040. This phase requires unprecedented coordination between declining fossil fuel systems and emerging renewable alternatives. The chapter addresses governance structures, financial mechanisms, and risk management strategies necessary for maintaining essential services while building sustainable alternatives. Success depends on the strategic preservation of infrastructure including natural gas refining and distribution, coordinated phase-in and phase-out timing, and comprehensive support for workers and communities throughout the transformation period.

Chapter 12: New Narratives for New Frontiers addresses the psychological and cultural dimensions of economic transformation. Alberta's oil-centric identity has become a limiting factor, hindering the recognition of economic diversification that is already occurring throughout the province. Young Albertans estimate that 40-70 per cent of provincial jobs are derived from oil extraction, whereas reality shows that less than five per cent are.[11] The chapter demonstrates how conscious narrative work can reshape provincial identity, building on successful transformations in Singapore, Ireland, and Scotland. Alberta must reframe itself from being an **oil producer defending the past** to being an **innovation leader solving tomorrow's problems**.

Report Methodology

To research *New Frontiers* Environmental Defence Canada undertook the following activities:

- Conducted one-on-one interviews with 75 leading business people, economists, energy specialists, political decision makers and Indigenous community members.
- Read more than one hundred reports and academic journal articles
- Reviewed podcasts such as The Energy Transition, Energy vs Climate, Zero, Catalyst, and Energy Transition Solutions

Artificial Intelligence Disclaimer

Due to the sheer volume of research material, Artificial Intelligence (Claude.ai) was utilized to collate data, facilitate comparisons between research findings, and develop visualizations for the final report. Data used to construct charts created by AI is outlined in the Research Notes.

[11] Lane, Janet and David Finch. 2022. "Alberta's Economy is Diversifying, but it Still Has Some Challenges to Overcome." The Globe and Mail. July 1. https://www.theglobeandmail.com/opinion/article-alberta-oil-gas-diversification-economy/

A Note About the Numbers

- **Budget Estimates:** Throughout the report, estimates are provided for necessary investments based on the best available information from existing reports, government websites, and one-on-one interviews.
- **Timelines** used throughout this report are straightforward. 2025, 2030, 2040, and 2050 are the benchmarks for all proposed programs and projects in New Frontiers.

The Core Challenge

Alberta's economy faces structural vulnerability due to its heavy reliance on oil and gas revenues, which account for 20-25 per cent of provincial revenue,[12] despite employing only five per cent of the workforce.[13] Global energy markets are shifting decisively toward renewables, with the International Energy Agency projecting that 40 per cent of the worldwide energy supply will come from renewable sources by 2030.[14] Alberta produces some of the world's most expensive and carbon-intensive oil, with breakeven costs of $74 per barrel –the highest among all producers globally.[15] Meanwhile, 97 per cent of Alberta's crude exports flow to the United States, creating dangerous market concentration precisely when America pursues energy independence and global markets increasingly favour low-carbon alternatives.[16]

The Strategic Vision

New Frontiers presents a comprehensive 25-year transformation strategy that leverages Alberta's entrepreneurial spirit, skilled workforce, and abundant renewable resources to build lasting economic prosperity. The approach focuses on developing five key economic sectors — Housing, Manufacturing, Construction, Healthcare, and Professional Services — currently accounting for 38.7 per cent of provincial GDP, with the potential to reach 50 per cent by 2050. Simultaneously, Alberta can achieve 90-95 per cent renewable electricity generation and mass storage[17] while creating 280,000-400,000 clean energy jobs and establishing itself as a hub for renewable energy exports in North America.[18]

12 Alberta Finance, Budgets, Revenue: https://www.alberta.ca/revenue

13 Alberta Energy, Oil Sands Fact Sheets: https://www.alberta.ca/oil-sands-facts-and-statistics

14 International Energy Agency (IEA), https://www.iea.org/energy-system/renewables

15 Pembina Institute, https://www.pembina.org/blog/real-ghg-trend-oilsands

16 OilPrice.com: https://oilprice.com/Energy/Crude-Oil/Alberta-Doubles-Down-on-US-Oil-Exports.html

17 Canadian Climate Institute, https://institutclimatique.ca/wp-content/uploads/2024/08/Achieving-Net-Zero-Electricity-in-Alberta-1.pdf

18 Clean Energy Canada, https://cleanenergycanada.org/albertas-booming-renewables-industry

New Frontiers: Master Implementation Timeline

Phase	Key Milestones
2025-2030 Foundation Phase	1. Repeal renewable energy restrictions and level the playing field for energy regulations 2. Reduce oil/gas revenue dependence from approximately 25% to 15% 3. Double installed residential, commercial solar 4. Launch comprehensive retrofit programs, establish Energy Transition Hubs, and reduce provincial energy consumption by 8-15 per cent 5. Establish Economic Transition Authority, transition 37,500 oil/gas workers; create 60,000 new clean energy jobs and build comprehensive training infrastructure[19] 6. Expand Indigenous renewable projects, implement project quotas for Indigenous equity, and provide $100-200M in foundational capacity building 7. Begin equipment electrification incentives,invest in agri-food processing and establish controlled environment agriculture pilots
2030-2040 Acceleration Phase	1. Reduce oil/gas revenue dependence to 6 per cent; achieve 47 per cent GDP from the Core Five, and complete major infrastructure modernization 2. Reach 75-93 per cent renewable electricity, deploy 7,000-12,000 MW storage and complete grid modernization. 3. Achieve 18-25 per cent provincial energy reduction,complete 125,000-400,000 building retrofits, and establish net-zero building standards 4. Transition an additional 56,250 oil/gas workers, create 120,000 new renewable energy jobs, establish manufacturing and technology hub. Launch major regional projects (50-100 MW solar/wind farms), and invest $500M-$1B+ in Indigenous-led energy infrastructure 5. Double processing capacity, establish large-scale CEA facilities, and expand plant-based processing and value-added manufacturing 6. Establish wind turbine and battery production facilities, achieve 10 per cent manufacturing GDP contribution, and create 85,000-120,000 jobs 7. Integrate research-clinical care facilities, achieve 8 per cent healthcare GDP contribution, and expand biotechnology development

[19] This might be modelled on the Just Transition for Canadian Coal Power Workers and Communities https://www.canada.ca/en/environment-climate-change/services/climate-change/task-force-just-transition.html

2040-2050 Optimization and Leadership Phase	1. Reduce oil/gas revenue dependence to 1 per cent, achieve 50 per cent+ GDP from the Core Five sectors, and establish global competitiveness leadership 2. Achieve 93-95 per cent renewable electricity, complete full electrification infrastructure, and establish Alberta as a renewable power and product energy exporter 3. Complete 25 per cent provincial energy reduction and achieve carbon-neutral operations across all sectors 4. Complete transition of final 37,500 oil/gas workers. Maintain 15,000 in specialized roles, and achieve 419,000 clean energy jobs 5. Ensure virtually all remote communities are off-diesel, achieve mainstream integration in advanced technologies, and complete revenue-sharing mechanisms 6. Integrate all 40,000 farms into an electrification program, achieve $31B agricultural GDP, and complete carbon-neutral production 7. Establish Alberta as North America's sustainable development hub, achieve global technology leadership, and export transformation model 8. Maintain minimal gas operations for essential services, complete mid-transition coordination, and optimize system integration.

Natural Asset Protection

The drive to advance an energy transition agenda in Alberta is not an excuse to forsake the conservation of biodiversity, the protection of endangered species, or the preservation of significant cultural and historic resources.

> "Projections estimate that renewables will supply 90 per cent of the world's power consumption by 2050, with solar and wind providing the majority. Yet, this transition must not compromise ecological integrity or social equity. Planners and stakeholders must use transparent processes and inclusive dialogue to integrate environmental and social considerations into the shift to cleaner energy."
>
> - Jane Marsh, *Renewable Energy Magazine*, June 2025.[20]

In the race to transition to renewable energy sources, biodiversity protection cannot be sacrificed, according to articles published in *Science Direct*. Therefore, regional and site-specific ecological thresholds must be established, protected areas and endangered species protected, and cumulative impacts carefully determined and

[20] Jane Marsh, Renewable Energy Magazine, June 2025, https://www.renewableenergymagazine.com/opinion/jane-marsh

respected.[21] For more information, *Grist* and *Energi Media* have published a primer.[22]

Land Use Planning Considerations

Biodiversity Conservation: Transit-oriented development and urban densification reduce pressure on natural habitats that would otherwise be affected by sprawl. Green infrastructure, including urban forests, wetland preservation, and wildlife corridors, provides ecological services while enhancing the quality of life. Sustainable forestry practices support mass timber production while maintaining forest health.

Water Resource Management: Industrial water recycling and efficiency programs reduce consumption while protecting water quality. Green infrastructure manages stormwater while reducing flood risks. Agricultural irrigation modernization, supported by $933 million in provincial investment, improves efficiency while supporting food processing development.[23]

Air Quality Improvement: Emissions reductions across all sectors enhance air quality, supporting improved health outcomes. Clean transportation systems, including electric vehicle infrastructure, reduce transportation emissions. Industrial emissions controls and monitoring ensure continuous improvement in air quality.[24]

Key Themes and Conclusions

New Frontiers demonstrates that Alberta's energy transition represents an economic opportunity rather than an economic threat. The province possesses exceptional renewable energy resources, a skilled workforce, an entrepreneurial culture, and strategic geographic advantages that are necessary for a successful energy and economic transformation. However, current regulatory barriers and psychological constraints prevent Alberta from realizing its full potential in the global clean energy economy.

New Frontiers emphasizes building on Alberta's existing strengths rather than abandoning its foundations. Success requires moving beyond defensive posturing about oil and gas toward confident leadership in industries defining the next economy.

Alberta's economic and energy transformation provides a model for other resource-

[21] Science Direct, Renewable energy and biological conservation in a changing world, https://www.sciencedirect.com/science/article/abs/pii/S0006320721004067

[22] Energi Media, first published in Grist, January 17, 2024. https://energi.media/news/how-to-build-renewables-without-threatening-biodiversity-carefully

[23] Government of Alberta. "Alberta Advantage." Available at: https://www.alberta.ca/alberta-advantage

[24] For a more in-depth review of the challenge posed by siting renewable energy projects in natural areas, visit the Environmental Defence Blog. Environmental Defence, November 1st 2024. https://environmentaldefence.ca/2024/11/01/nature-energy-following-a-new-path-forward/

dependent regions facing similar challenges. This transition represents not only an environmental necessity, but also an opportunity to build a more diverse, resilient, cleaner and prosperous Alberta economy for current and future generations.

The choice facing Alberta is stark but clear: either embrace the energy transition and capture its benefits, or prepare for economic irrelevance as global markets shift away from fossil fuels. The province that pioneered oil sands development and eliminated coal power ahead of schedule, possesses the innovation, determination, and technical capacity needed for this transformation.

Chapter 1: Embracing New Frontiers

CHALLENGE QUESTIONS: CHAPTER 1

- **How** can we embrace inclusivity across cultures, economic classes and the rural-urban divide when Alberta pursues an economy-wide energy transition?
- **What** "New Frontiers" can we imagine for Alberta when it puts the full force of its creativity and imagination behind a province-wide transition from oil and gas to a renewable economy?
- **What** is the cost — in future economic prosperity, and in human potential and capacity — of failing to seize on the opportunities of an ambitious energy transition?

Alberta is a Frontier Province

The first human inhabitants of this province were Indigenous people who have been in Alberta since the beginning of time. For millennia, they hunted and fished, followed the great bison herds, harvested berries and medicine, and created vast nations of linguistic commonality.[25]

Alberta was the frontier, and Alberta's settlers became frontierspeople, busting sod, damming rivers, cutting timber, converting the native prairie to crops, and eventually drilling wells to tap into oil and natural gas. The first oil well in Western Canada was drilled in what is now Waterton Lakes National Park in 1904; twenty years later, a massive natural gas field was discovered in Turner Valley; thirty years after that, Leduc No. 1 struck oil (1946).[26,27]

In 1967, Suncor opened the first oil sands refinery in north-eastern Alberta, and the province quickly became an energy superpower. With that status came enormous amounts of wealth, massive booms and deep economic busts, and a sense that the province's destiny was now tied to the vacillating commodity market in petroleum.[28]

[25] Indigenous Paleolithic of the Western Hemisphere. University of Nebraska Press.

[26] Oil Sands Magazine. 2022. "History of the Canadian Oil Sands." March 29. https://www.oilsandsmagazine.com/news/2022/3/29/history-of-the-canadian-oil-sands

[27] "Timeline of the Petroleum Industry in Alberta." Accessed 2025. https://en.wikipedia.org/wiki/Timeline_of_the_petroleum_industry_in_Alberta

[28] "History of the Canadian Oil Sands." March 29. https://www.oilsandsmagazine.com/news/2022/3/29/history-of-the-canadian-oil-sands

What happened next was the astonishing growth of Alberta's economic fortunes. By the end of the nineteen seventies, Alberta's economic output had risen from middle-of-the-pack to country leading, as demonstrated by the chart below.

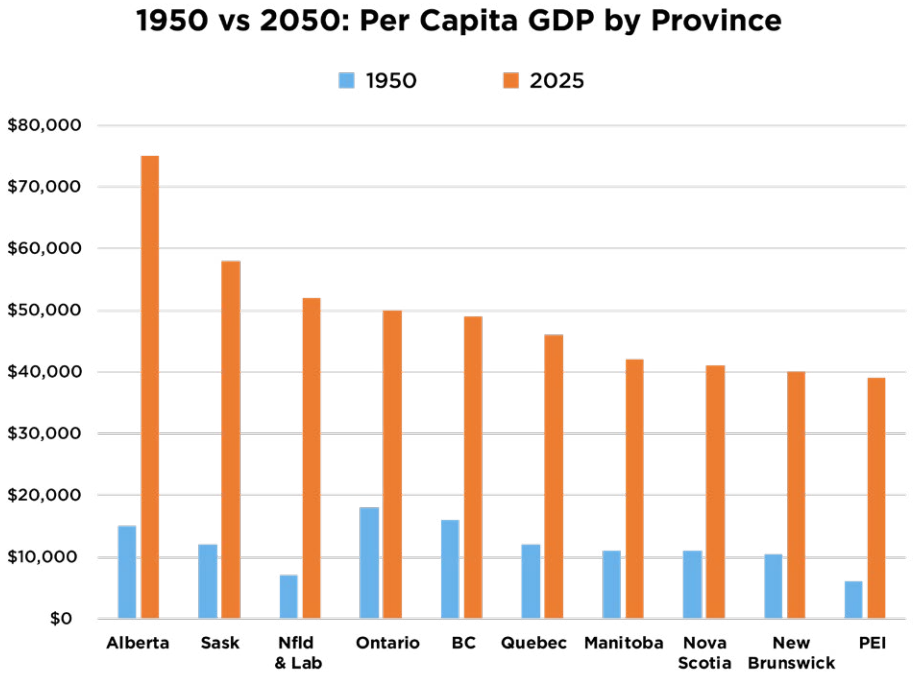


Chart 1: Historical and current data from Statistics Canada show the relative per capita GDP in Canada's provinces, from 1950 to 2025.

For Alberta to continue to lead Canada in economic growth in the next five, 10 or 15 years, it must embrace an economic and energy transition unlike any this province, this country, or the world has ever experienced. This change will *not* happen at some point in the future. It is happening *now*.[29] Alberta can play an important role in this shift. That's what New Frontiers seeks to demonstrate.

A Province at Risk

Alberta's economy faces structural vulnerability due to its heavy reliance on oil and gas revenues, which account for 20-25 per cent of the provincial income, despite employing only five per cent of the workforce. Global energy markets are shifting decisively toward renewables, with

Managed Transition: We determine our future; supporting workers, incentivizing new industries, and prioritizing communities.

Status Quo: We allow others to determine our future; prioritizing profits, blocking new industries, and prioritizing wealthy corporations

[29] The World Economic Forum, In charts: The energy transition in 2025 https://www.weforum.org/stories/2025/06/energy-transition-progress-in-charts/

the International Energy Agency projecting that 40 per cent of the worldwide energy supply will come from renewable sources by 2030.[30]

Alberta produces some of the world's most carbon-intensive oil. Meanwhile, 97 per cent of Alberta's crude exports flow to the United States, creating dangerous market concentration precisely when America pursues energy independence and global markets increasingly favour low-carbon alternatives.[31]

The Climate Imperative

This is the only reference to climate change you will read in this document. Almost. Climate change represents one of Canada's most pressing challenges, with accelerating impacts already transforming the country's physical, economic, and social landscape. This section provides context for why this report focuses exclusively on energy transition solutions.

Canada has experienced unprecedented climate-driven disasters. The 2023 wildfire season burned more than 18 million hectares,[32] forcing over 230,000 people from their homes. Canada's climate has warmed about twice the global average, with mean annual temperature increases of 1.7°C for Canada as a whole and 2.3°C for northern Canada between 1948 and 2016.

Given the well-established nature of these climate challenges, this report focuses on examining energy transition pathways that can contribute to greenhouse gas emission reduction objectives.

30 The International Energy Agency, Global renewable capacity is set to grow strongly, driven by solar PV https://www.iea.org/news/global-renewable-capacity-is-set-to-grow-strongly-driven-by-solar-pv

31 The Energy Mix, Alberta's "Friendly" is most carbon intensive in new international energy index. https://www.theenergymix.com/albertas-friendly-oil-is-most-carbon-intensive-in-new-international-index/

32 The Canadian Interagency Forest Fire Centre, https://www.ciffc.ca/sites/default/files/2024-03/CIFFC_2023CanadaReport_FINAL.pdf

Chapter 2: The Case for Energy Transition

Chapter Summary

Alberta faces an emerging economic crisis that demands timely action.[33] The province's reliance on oil and gas exports to support its core budget poses a threat to its future prosperity, as global energy markets rapidly shift toward renewable sources. The International Energy Agency's (IEA) report *The Energy World is Set to Change Significantly* projects that 40 per cent of the worldwide energy supply will come from renewables by 2030, while demand for oil and gas products is expected to peak between 2026 and 2028.[34]

Alberta produces some of the world's most expensive and highest-carbon oil.[35] This dangerous concentration creates vulnerability as the United States of America pursues energy self-sufficiency and global markets increasingly favour low-carbon alternatives.[36]

CHALLENGE QUESTIONS: CHAPTER 2
? **How** will the IEA's prediction that 40 per cent of the world's energy supply will come from renewables by 2030 impact Alberta's economy?
? **What** does Alberta need to do to manage a 25 -year economic and energy transition away from oil and gas and its royalties, to a diversified economy?
? **If** Alberta wants to regain its status as an innovator and entrepreneurial province, can it do so by embracing the energy transition of 2025 the same way it did in 1914 with natural gas and 1964 with the oil sands?[37]

[33] The Canadian Climate Institute, https://climateinstitute.ca/the-biggest-challenge-to-albertas-energy-transition-isnt-what-you-think/

[34] International Energy Agency. 2023. "The Energy World is Set to Change Significantly by 2030." https://www.iea.org/news/the-energy-world-is-set-to-change-significantly-by-2030-based-on-today-s-policy-settings-alone

[35] Oil and Gas Info. 2020. "Oil Supply Costs." https://oilandgasinfo.ca/patchworks/oil-supply-costs/

[36] International Energy Agency. 2024. "Oil 2024 Report." https://www.iea.org/energy-system/fossil-fuels/oil

[37] To review some of Alberta's previous energy transitions, review the timeline in Appendix C, page 109.

KEY RECOMMENDATIONS

Immediate Action (2025-2030)
Eliminate renewable energy restrictions imposed in 2024 and harmonize approvals for wind, solar, oil, gas, and battery storage projects
Set binding energy transition targets: 40 per cent renewable electricity by 2035, 93 per cent by 2050[38]
Cap fossil fuel revenue dependency at 15 per cent of provincial income by 2030, one per cent by 2050
Using this guide as a starting point, develop a 25-year transition strategy aligned with federal climate goals, with a focus on transitioning from energy exports to domestic energy products.
Launch a public engagement campaign to redefine Alberta's energy identity around innovation, creativity, and sustainability

Medium Term Projects (2030-2040)
Scale renewable energy deployment through competitive incentives and supportive regulations
Diversify export markets by investing in renewable energy exports and value-added manufacturing
Support workforce transition with retraining programs and competitive wages in emerging industries
Complete energy transition to 100 per cent net-zero domestic energy

Long Term Vision (2040-2050)
Establish export leadership as North America's renewable energy and clean technology hub, which may include installed capacity, export of electricity, and/or manufacturing of renewable energy components.
Allow for the transformation of Alberta's cultural and economic identity.
Complete a 25-year transition towards an economically diverse, culturally rich, and environmentally sustainable society.

[38] A 93 Per Cent target is based on projections completed by the Pembina Institute, backed by data from the Canadian Energy Regulator, and other government agencies, for how much renewable power can be built in Alberta over the next 25 years in a cost effective, equitable manner. The remaining seven per cent is an estimate of how much natural gas (methane) will be needed as a backstop to ensure grid performance under any circumstance.

Economic Vulnerability and Market Reality

The province's oil market faces three critical disadvantages in global markets. First, Alberta produces North America's most carbon-intensive crude.[39] Second, its cost makes Alberta's oil uncompetitive as global prices decline. Third, the province's overwhelming dependence on a single export market — the United States — creates dangerous vulnerability.[40]

To respond to this crisis Alberta has a choice to make: follow old pathways that reject the global energy transition, while allowing oil and gas companies to make exorbitant profits and deplete the province's remaining oil and gas reserves. This could result in billions of dollars in stranded assets and taxpayer-supported liabilities, as well as challenges to employment and government revenue. Or, Alberta can explore a new frontier that supports opportunities for investment in renewable energy, creates new export markets, invests in manufacturing and construction, and results in a more robust economy.

Illustration 1 © Environmental Defence Canada. Alberta has a choice to make: follow old pathways, or embark on a journey into new frontiers.

What is a Transition?

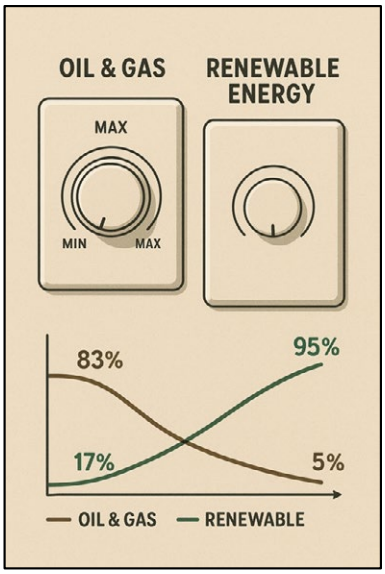
According to the Oxford Dictionary, a transition is "the process or a period of changing from one state or condition to another."[41] While the auspices for an energy transition in Alberta are urgent, a transition is defined as occurring over a "period of time." Therefore, think of an energy transition in these terms: A pair of dimmer

[39] "The Real GHG Trend: Oilsands Among the Most Carbon Intensive Crudes in North America." https://www.pembina.org/blog/real-ghg-trend-oilsands

[40] Canadian Energy Regulator. 2024. "Market Snapshot: Almost All Canadian Crude Oil Exports Went to the United States in 2023." https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/market-snapshots/2024/market-snapshot-almost-all-canadian-crude-oil-exports-went-to-the-united-states-in-2023.html

[41] Oxford English Dictionary, online edition, (entry updated 2019) https://www.oed.com/dictionary/transition_v?tl=true

light switches represents our current energy profile. The switch on the right represents fossil fuel-based energy, and on the left is renewable energy. Over the course of the next twenty-five years, we will methodically increase the energy coming from renewables, while decreasing the energy from fossil fuels. As renewable energy replaces conventional energy, different strategies are needed for domestic use and for energy export. As the transition continues, mid-course corrections can be made, adjustments to new opportunities and challenges addressed, and the well-being of people and communities reconsidered.



Context for an Energy Transition

Alberta has been a pioneer in energy development for over a century. However, after nearly seventy years of prosperity, Alberta now faces potential economic decline due to its heavy dependence on volatile non-renewable resource revenues.

According to multiple industry sources, Alberta's royalty revenues from conventional and unconventional oil and gas products, and shows the bump in conventional oil royalties during the OPEC crisis, and the spike in natural gas prices during the early 2000s. As oil sands production skyrocketed starting around 1980, and broke the one million barrels per day production in 2014, profits remained modest due to the high overhead costs of development.[42] By 2021, however, those capital expenditure costs (CAPEX) were essentially paid down for most of the major oil sands facilities, so profits and associated royalties have skyrocketed. With demand expected to peak in the next five years, Alberta's finances are in a precarious position as demand for crude oil is expected to fall.[43,44]

[42] Oil Sands Magazine. https://www.oilsandsmagazine.com/projects/oilsands-mining#Yearly. Retrieved Aug 12, 2025

[43] Forbes Magazine, July 19th, 2025. https://www.forbes.com/sites/gauravsharma/2025/07/19/will-oil-demand-hit-123-million-barrels-per-day-by-2050-as-opec-says/

[44] Bloomberg NEF: https://www.bnnbloomberg.ca/markets/oil/2025/06/17/world-oil-demand-to-keep-growing-this-decade-despite-2027-china-peak-iea-says/

Shrinking Export Markets

Three major market shifts threaten Alberta's fossil fuel exports:

- **United States Energy Independence:** America has more than doubled its domestic oil production in two decades and expects to produce 25 per cent more oil than it consumes between 2025 and 2050.[45]
- **European Union Renewable Leadership:** The EU generates 43 per cent of its energy from renewable sources.[46] Further steady declines in fossil fuel demand are expected going forward under stated policies, with a near total collapse by 2050.
- **China's Renewable Dominance:** According to the World Economic Forum, China accounted for over 40 per cent of global renewable energy capacity and invested $818 billion in its energy transition in 2024 — more than double any other economy.[47] China produces 78 per cent of the world's solar panels, 65 per cent of wind turbines, and 77 per cent of lithium batteries.[48,49,50] As the second largest importer of crude oil from Alberta, China's energy transition should be a wake-up call.

Will Petrochemicals Replace Crude Exports?

Not likely. According to a 2024 report by Carbon Tracker, "Some of the largest oil and gas companies are pivoting towards petrochemicals as they reckon with the fact that a decline in transport fuel demand is imminent. Some continue to invest in oil production, expecting petrochemicals to fill the gap in oil demand; others invest in refinery upgrades, aiming to ramp up production of petrochemical feedstocks; others still expand in the chemical industry, looking for a new market."

Carbon Tracker concludes that growth in demand for petrochemicals, and projections of commercially viable yields, may be unrealistic.[51]

Stalled Renewable Progress

Alberta's renewable energy development has effectively stopped. The province

45 The US Energy Information Agency (EIA) https://www.eia.gov/energyexplained/oil-and-petroleum-products/use-of-oil.php

46 EuroStat. 2024. "Shedding Light on Energy in Europe -- 2024 Edition." https://ec.europa.eu/eurostat/web/interactive-publications/energy-2024

47 World Economic Forum, July 28, 2025, https://www.weforum.org/stories/2025/07/chinas-green-transformation

48 International Energy Agency. "Solar PV Global Supply Chains." https://www.iea.org/reports/solar-pv-global-supply-chains/executive-summary

49 Wood MacKenzie. 2024. "China Leads Global Wind Turbine Manufacturers' Market Share in 2023."

50 Visual Capitalist. 2022. "Visualizing China's Dominance in Battery Manufacturing (2022-2027P)."

51 Carbon Tracker, Petrochemical Imbalance, https://carbontracker.org/reports/petrochemical-imbalance/

added just 50 MW of renewable capacity in the eight months following the 2024 regulatory restrictions, a dramatic reversal from the promising gains between 2016 and 2023, when the available supply of renewable energy increased by 1030 MW — more than 1,200 per cent.

Success Stories: New Mexico's Transformation

New Mexico provides a compelling example of how an oil-producing region can successfully transition to a renewable energy leader. New Mexico has quadrupled its renewable energy percentage between 2016 and 2023, achieving 63 per cent renewable electricity while maintaining its oil export economy.[52]

New Mexico has benefited from the now-defunded Inflation Reduction Act (IRA) to provide about $10 billion in renewable energy investment to date, and another $1.46B per year is expected to be spent to complete a transition to 100 per cent domestic renewable energy. According to 350.org, "the funding for this investment will come from businesses, individuals and governments who want to save on their electric bills, and from borrowing by electric utilities in the form of bonds from investors, just as all coal and gas plants are financed."

A detailed document on New Mexico's energy transition, prepared by 350.org, is available for download.[53]

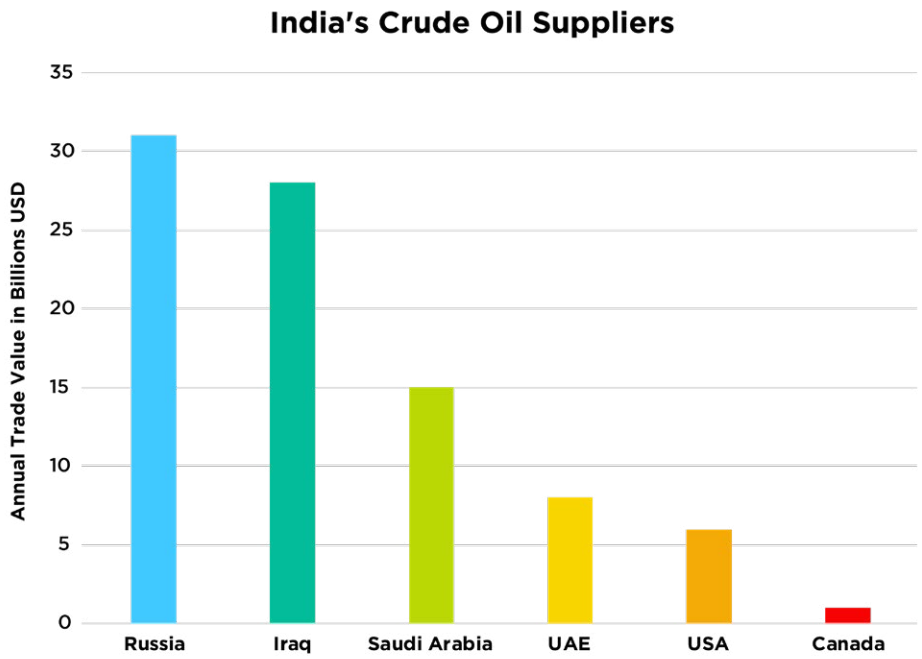
European Union Leadership

The European Union has invested in large-scale renewable energy deployment across diverse economies and geographies. By 2022, renewables accounted for 43 per cent of EU energy production, while nuclear sources contributed 28 per cent, and fossil fuels collectively accounted for 28 per cent.[54]

[52] Environment Texas Research and Policy Centre. "The State of Renewable Energy Dashboard." https://environmentamerica.org/texas/center/resources/the-state-of-renewable-energy-dashboard/

[53] 350.org New Mexico, Vision for NM Clean Energy v1.2 https://docs.google.com/document/d/1mXszaX1Jwimgk1J9bx6Ivzadoygz62KW1q9-bKp4ogU/edit?tab=t.0

[54] EuroStat. 2024. "Shedding Light on Energy in Europe -- 2024 Edition." https://ec.europa.eu/eurostat/web/interactive-publications/energy-2024



Maybe India will buy our oil?

India represents a complex and evolving energy market that has attracted attention from Alberta's oil and gas industry as a potential destination for Canadian petroleum exports. India is currently the world's third-largest consumer of petroleum and the fifth-largest importer of crude oil, with imports exceeding 4 million barrels per day (bpd), projected to increase to 9 million bpd by 2040.[55] Despite this massive consumption, Canada currently captures less than 1 per cent of India's petroleum import market, selling between $500 million and $1.18 billion worth of crude oil annually to the country.

The economic argument for expanding Canadian energy exports to India centers on the country's projected long-term energy demands during its energy transition period. Proponents, such as Vijay Sappani of the Macdonald-Laurier Institute, argue that "India will take decades to transition to green energy" and that "Canada can easily provide the crude oil and natural gas it will need as it pursues this transition."[56] However, this growth occurs alongside India's access to cheaper, more convenient sources of oil, and significant expansion of renewable energy, as the country added 24 gigawatts of solar capacity — enough to power 18 million homes — in 2024 and has committed to achieving net-zero emissions by 2070.

[55] Centre for International Governance Innovation report on India's oil consumption projections, https://www.eximpedia.app/blog/crude-oil-import-in-india

[56] The Financial Post, Opinion: We need a Canada-India energy pact https://financialpost.com/opinion/opinion-we-need-a-canada-india-energy-pact

What about the promise of Liquified Natural Gas (LNG)?

LNG may appear as a great prospect for Alberta to maintain its role as an exporter of petroleum products beyond 2040. It isn't.[57] Alberta faces *significant* challenges penetrating the global LNG market as a latecomer to an increasingly crowded field. While the province is actively courting Asian markets, particularly Japan, Alberta must compete against established players in a market where major importers are already reducing consumption. Japan, South Korea, and Europe — which together account for more than half of the world's LNG demand — saw combined imports fall in 2023 and are projected to continue declining through 2030. Penetrating established supplier relationships and securing long-term contracts in declining markets presents formidable obstacles.

The global LNG market is rapidly transitioning from a shortage to a severe oversupply, fundamentally undermining Alberta's prospects for generating a substantial new revenue stream.[58] Industry analysis indicates that global LNG supply capacity will reach 666.5 million tonnes per annum (MTPA) by 2028, exceeding the International Energy Agency's demand scenarios through 2050. The concern highlighted by analysts is that capacity coming online through 2028 exceeds IEA long-term demand scenarios through 2050, meaning that even decades from now the projected demand (482 MTPA in 2050) would still be less than the supply capacity being built by 2028.[59]

More critically, the LNG market is expected to experience a supply surplus over demand from 2027 onwards, with a projected oversupply of 63 million tons by 2030.[60] The IEA's analysis confirms this glut will persist into the 2030s, with no new LNG supply required until 2040 at the earliest under conservative transition scenarios. This oversupply will depress prices and create intense competition among exporters, with many LNG projects unlikely to earn returns on their capital investments.

For Alberta, these market dynamics severely constrain the potential for LNG to become a significant revenue generator comparable to oil sands production. While current natural gas producers have curtailed production between 800 million and 1 billion cubic feet per day due to low prices, even the successful commissioning of LNG Canada — requiring around 2.1 billion cubic feet per day — is unlikely to transform provincial revenues significantly.[61]

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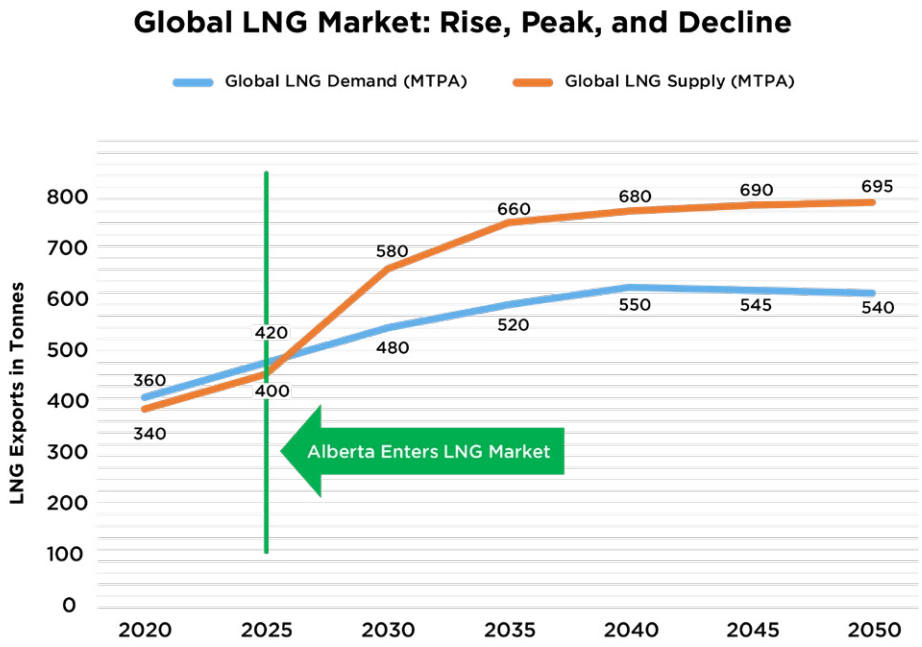
57 International Institute for Sustainable Development (IISD) https://www.iisd.org/articles/deep-dive/canadian-lng-is-not-path-to-energy-security-stronger-domestic-economy

58 US Department of Energy, www.energy.gov/sites/default/files/2024-06/

59 Institute for Energy Economics and Financial Analysis. https://ieefa.org/resources/global-lng-outlook-2024-2028

60 The National Observer, https://www.nationalobserver.com/2025/08/20/analysis/lng-canada-exports-green-transition

61 Alberta Energy. "Phasing Out Emissions from Coal." https://www.alberta.ca/climate-coal-electricity



To sum it up: Alberta can't count on LNG to replace crude oil as a driver of its economic growth and royalty revenue. We're entering the market too late to take advantage of the gap between undersupply and growing demand. Instead, we are coming on-stream just as demand drops below supply, reducing prices and making the LNG market in India, South Korea, China, Japan and elsewhere hyper-competitive.

The Critical Minerals "Gold" Rush

Alberta possesses modest geological potential for critical minerals and rare earth elements that could transform the province's economic landscape over the next 25 years. The province has potential for several critical minerals, including lithium in formation waters, vanadium and rare earth elements in oil sands waste streams, potash in eastern Alberta, uranium in southern and northeastern Alberta, and helium in southeastern Alberta. This opportunity is driven by unprecedented global demand,[62] with lithium demand potentially rising by over 1,500 per cent by 2050, with similar increases for nickel, cobalt and copper. The combined market value of key energy transition minerals is expected to more than double by 2040 in climate-driven scenarios, reaching USD 770 billion.[63]

[62] SFA Oxford. "Alberta's Critical Minerals and the Energy Transition." https://www.sfa-oxford.com/lithox/critical-minerals-policy-legislation/all-countries/north-america/canada/alberta-critical-minerals-energy-transition/

[63] UN Trade and Development. "Critical minerals boom: Global energy shift brings opportunities and risks for developing countries." https://unctad.org/news/critical-minerals-boom-global-energy-shift-brings-opportunities-and-risks-developing-countries

Projections by the Canadian and Alberta governments suggest that Alberta's critical minerals sector could contribute $25-40 billion annually to provincial GDP by 2050, representing 20-35 per cent of the current oil and gas sector's economic scale, while generating 250,000-400,000 total jobs, including indirect and induced employment effects.[64,65]

Alberta's strategic advantages include extensive geological data and abundant infrastructure, including roads, rails, well sites and power lines necessary to develop critical minerals, positioning the province to leverage existing expertise while diversifying its economy for the global clean energy transition.[66]

For more detailed information on Alberta's opportunities and challenges associated with the development of critical and rare earth minerals, please see Chapter 9.

Alberta's Proven Capacity for Rapid Change

Alberta has already demonstrated its ability to execute large-scale energy transitions. The province eliminated coal-fired electricity by June 2024 — six years ahead of the 2030 legislated target. This coal phase-out success proves Alberta possesses the technical expertise, regulatory capacity, and political will to execute rapid energy transitions.[67]

Global Investment Trends

According to Bloomberg NEF, in a January 2025 report, Global capital markets have decisively shifted toward renewable energy. Renewable energy investments now nearly double fossil fuel investments, with major financial institutions divesting from oil and gas while funding clean energy projects.[68]

Alberta's Renewable Energy Potential

Alberta possesses exceptional renewable energy potential that remains largely untapped due to policy barriers rather than technical limitations. Kuby Renewable Energy references calculations made by Dr. Sarah Hastings-Simon, stating that 115,370 hectares of solar panels could supply 100 per cent of Alberta's electricity

64 Alberta Energy Regulator, Building a future for critical and rare earth minerals in Alberta https://www.alberta.ca/release.cfm?xID=802883CC47846-F888-DE0C-F10E895C1536D91C

65 Statistics Canada, Economic contribution of critical mineral production in Canada, 2023 https://www150.statcan.gc.ca/n1/daily-quotidien/251006/dq251006a-eng.htm

66 Alberta Federation of Labour. "Ground-breaking Report from Alberta Unions." https://afl.org/blog/

67 The Energy Mix, https://www.theenergymix.com/alberta-completes-coal-phaseout-six-years-ahead-of-schedule/#:

68 Bloomberg NEF, January 2025. https://about.bnef.com/insights/finance/global-investment-in-the-energy-transition-exceeded-2-trillion-for-the-first-time-in-2024-according-to-bloombergnef-report/

demand — an area less than one per cent of the province's surface.[69,70]

According to the Pembina Institute, "renewable energy (solar and wind) is cheaper than conventional gas-fired power in Alberta, with a recent analysis showing renewables costing $9 to $24 less per megawatt-hour than gas-generated power. This trend is driven by falling costs for wind, solar, and storage technologies, which are expected to continue to fall. Decarbonizing Alberta's energy grid with renewables could save households hundreds of dollars annually and create economic opportunities, while continued investment in new natural gas plants risks stranded assets and higher consumer costs."[71]

Strategic Implementation Pathway

Alberta must pursue parallel transitions in domestic power use, along with the aforementioned export markets. The domestic transition provides the foundation for broader economic diversification:

- **Current Status:** 85 per cent fossil fuel electricity generation, primarily natural gas.
- **Target:** 40 per cent renewable by 2035, 93 per cent by 2050.
- **Benefits:** Stable, low-cost, secure power grid supporting industrial competitiveness

Conclusion

Alberta can continue depending on volatile, declining oil and gas markets while watching renewable energy innovation occur elsewhere, or it can leverage its entrepreneurial spirit, skilled workforce, and abundant renewable resources to lead Canada's clean energy transition.

The global energy market has shifted decisively toward renewables, and this transition accelerates daily. Countries and regions that adapt quickly will prosper, while those that resist change face economic decline and marginalization.

69 Kuby Renewable Energy, https://kuby.ca/solar/solar-information/articles/how-much-solar-energy-is-required-to-power-alberta.

70 Sarah Hastings-Simon, University of Calgary School of Public Policy, https://www.policyschool.ca/wp-content/uploads/2023/10/EE-TRENDS-SOLAR-OCT.pdf

71 Pembina Institute, Alberta's Renewable Energy Advantage, https://www.pembina.org/blog/albertas-renewable-energy-advantage

Chapter 3: Indigenous and Métis Leadership

Chapter Summary

Indigenous and Métis communities in Alberta are vital leaders in the province's energy transition, demonstrating remarkable innovation through major renewable energy projects. First Nations and Métis entities are partners or beneficiaries of nearly 20 per cent of Canada's electricity-generating infrastructure, with almost all producing renewable energy.

Over the course of research for this report I was privileged to discuss Alberta's energy transition with members of a variety of Nations, as well as attend a dozen outstanding presentations by Indigenous leaders on renewable energy and transition. Environmental Defence doesn't speak for any of these agencies or Nations; instead we have incorporated their advice into our work.

The Otipemisiwak Métis Government's Salay Prayzaan (Métis Crossing Solar Project), recently awarded the 2025 Emerald Award, exemplifies this leadership alongside projects including the Fort Chipewyan Solar Farm (2.8 MW with storage) and the Tilley Solar Project (23.6 MW) which could power as many as 20,000 homes.[72]

Despite these successes, Indigenous and Métis communities face substantial barriers, including limited access to capital, technical capacity gaps, and complex regulatory processes in advancing renewable energy projects.[73,74]

CHALLENGE QUESTIONS: CHAPTER 3

- ? **How** will we jettison colonial values and behaviours to ensure the advancement of an energy transition is fair, equitable and just for all Canadians?
- ? **What** strategic role can First Nations and Indigenous Communities play to advance renewable energy projects that Alberta's conservative regulatory environment might otherwise stall?
- ? **How** can we support — financially, or otherwise — Indigenous leadership in the energy transition while respecting the sovereignty and independence of First Nations communities and leadership?

[72] Métis Nation of Alberta. 2025. "Otipemisiwak Métis Government Celebrates Prestigious Emerald Award Win for Salay Prayzaan Solar Project." https://albertametis.com/news/otipemisiwak-metis-government-celebrates-prestigious-emerald-award-win-for-salay-prayzaan-solar-project/

[73] First Nations Financial Management Board, https://fnfmb.com/sites/default/files/2024-01/2023-10-16_idb_pre-scoping_study_final_report.pdf

[74] Canadian Climate Institute, https://climateinstitute.ca/wp-content/uploads/2022/02/ICE-report-ENGLISH-FINAL.pdf

KEY RECOMMENDATIONS

Policy and Regulatory Reforms
Implement renewable project quotas requiring Indigenous equity participation in all significant developments
Streamline permitting processes for Indigenous-led projects on reserve and settlement lands
Integrate Indigenous consultation and ownership clauses into Alberta's emission-reduction policies
Ensure renewable energy policies do not disproportionately restrict development on Indigenous territories
Expand the Alberta Indigenous Opportunities Corporation (AIOC) mandate to cover clean energy projects with loan guarantees up to $250 million

Financial and Investment Support
Provide dedicated grants ($30-50 million initially) for community renewables on reserves and settlements
Develop Indigenous clean-energy bonds and enhanced carbon credit access programs
Establish federal-provincial cost-sharing for major Indigenous renewable energy projects
Create blended financing mechanisms combining public grants (20-30 per cent) with private investment

Capacity Building and Training
Expand Alberta Indigenous Clean Energy Initiative (AICEI) and Indigenous Clean Energy Social Enterprise programs
Fund sustained workforce development through Indigenous Power Workers initiatives and trade training
Support Indigenous-run consultancies and clean-tech incubators to build local expertise
Establish long-term mentorship programs connecting Indigenous youth with clean energy careers
Develop Indigenous renewable energy research partnerships with academic institutions

Infrastructure and Partnership Development
Invest in grid connectivity upgrades to serve remote Indigenous communities and enable larger projects
Facilitate joint ventures between Indigenous nations and private developers with Indigenous majority ownership
Supporting piloting green infrastructure, including microgrids, fuel switching and energy efficiency retrofits for homes and buildings, and electric vehicle charging on reserves.
Establish revenue-sharing mechanisms from carbon pricing for community energy projects
Create formal partnership frameworks between utilities and Indigenous communities

Constitutional Jurisdiction

First Nations reserves have a degree of sovereignty over decision-making related to the development of renewable energy projects on their territory. The provincial government of Alberta has jurisdiction over all public land within the province, except for national parks, military land, and First Nations reserves, which are managed federally. However, the province maintains regulatory authority over new energy and electricity projects. This complex regulatory environment is being tested in court and remains uncertain.[75]

Salay Prayzaan Solar Farm (2024): The Otipemisiwak Métis Government's flagship 4.86 MW solar installation at Métis Crossing — enough power for about 1,200 homes — represents Alberta's largest Métis-led solar project. This entirely Métis-owned facility generates enough renewable electricity to offset the power needs of all Otipemisiwak Métis Government buildings across Alberta.

Fort Chipewyan Solar Farm (2021): Three Nations Energy GP Inc., jointly owned by Athabasca Chipewyan First Nation, Mikisew Cree First Nation, and the Fort Chipewyan Métis Nation, developed Canada's most extensive off-grid solar-plus-storage system. The 2.8 MW solar array, combined with 1.6 MWh of battery storage, now supplies approximately 25 per cent of the community's electricity.

Tilley Solar Project (2025): FNpower Inc., in partnership with Alexander First Nation, is commissioning the 23.6 MW Tilley Solar Project, which is expected to reduce

[75] Cassels, Powering Economic Reconciliation: Revisions to Alberta Utilities AUC Rule 007 Address Electricity and Gas Utilities Projects Developed in Partnership with Indigenous Communities https://cassels.com/?pdf=1&postid=20528#

greenhouse gas emissions by approximately 14,200 tonnes annually, power 20,000 homes, and represents over $52 million in investment.

Support Needed for Indigenous and Métis Leadership

The Alberta Indigenous Opportunities Corporation (AIOC), established in 2019, helps Indigenous Nations transform ideas into action, supporting Indigenous investment through loan guarantees of up to $3 billion. Since its inception, AIOC has supported 43 First Nations and Métis groups across eight projects, impacting over 60,000 people.[76]

The Alberta Indigenous Clean Energy Initiative (AICEI) helps First Nations and Métis communities maximize their investments in clean energy projects by providing support at any stage of development.

Financial Support and Capacity Building

There is a need to improve the patchwork of financing available between federal and provincial governments, which often have different application processes, requirements and timelines. Increased capital and better synergy between funding initiatives will help move projects forward more quickly and cost-efficiently.

The Alberta Indigenous Clean Energy Initiative (AICEI), funded through the Strategic Partnerships Initiative and led by Indigenous Services Canada, helps First Nations and Métis communities maximize their investments in clean energy projects by providing support at any stage of development.[77]

AIOC offers loan guarantees ranging from a minimum of $20 million to a maximum of $250 million for projects in the natural resources, agriculture, telecommunications, transportation, and tourism sectors, along with capacity support to help applicants connect with investment experts.

Knowledge Transfer and Education

The Métis Nation of Alberta plans to use the Rupertsland Centre for Teaching and Learning and the solar PV system to engage over 10,000 Indigenous and Metis students and adult learners in renewable energy, climate change and energy efficiency annually, demonstrating the importance of educational components in Indigenous energy projects.

Federal Program Support

The federal government's Wah-ila-toos initiative provides funding for clean energy projects to reduce diesel use in Indigenous, rural and remote communities, supported

[76] Alberta Indigenous Opportunities Corporation, https://theaioc.com/

[77] Alberta Indigenous Clean Energy Initiative, https://www.canada.ca/en/prairies-economic-development/services/funding/alberta-indigenous-clean-energy-initiative.html

by an Indigenous Council consisting of six representatives who guide program development to reduce barriers and complexities.

Other sources for federal funding include:

- Indigenous Leadership Fund[78]
- Clean Energy for Rural and Remote Communities (CERRC)[79]
- Indigenous Off-Diesel Initiative IODI[80]
- Strategic Partnerships Initiative (SPI)[81]

Timeline and Strategic Recommendations (2025-2050)

Phase 1: Foundation Building (2025-2030)	Phase 2: Scaling Up (2031-2040)	Phase 3: Mainstream Integration (2041-2050)
Estimated Investment: $100-200 million in public and private co-investment	Estimated Investment: $500 million to $1+ billion	Estimated Investment: $1-2+ billion
Key Actions		
Expand the Alberta Indigenous Clean Energy Initiative (AICEI) and Indigenous Clean Energy Social Enterprise programs for training and project planning.	Integrate Indigenous consultation and ownership clauses into Alberta's emission-reduction policies.	Estimated Investment: $1-2+ billion
Implement renewable project quotas requiring Indigenous equity participation in bid processes	Launch major regional projects: several 50-100 MW solar or wind farms co-owned with Nations	Estimated Investment: $1-2+ billion
Provide dedicated grants ($30-50 million total) for community renewables on reserves and settlements.	Invest in grid connectivity upgrades to serve remote and Indigenous areas.	Estimated Investment: $1-2+ billion

78 www.canada.ca/en/environment-climate-change/services/climate-change/low-carbon-economy-fund/indigenous-leadership.html

79 https://natural-resources.canada.ca/funding-partnerships/clean-energy-rural-remote-communities-program

80 https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/reduce-emissions/reducing-reliance-diesel/indigenous-off-diesel-initiative.html

81 https://www.sac-isc.gc.ca/eng/1330016561558/1594122175203

Support pilot green infrastructure, including microgrids and EV charging on reserves	Expand financing tools, including Indigenous clean-energy bonds, expanded AIOC guarantees, and carbon credit programs.	Develop revenue-sharing mechanisms based on carbon pricing for community energy projects
Continue intergovernmental agreements to streamline permitting processes.		Encourage Métis involvement in green job sectors.
Support community energy efficiency and retrofit programs to reduce demand.		

Strategic Recommendations

Enhanced Financial Mechanisms: AIOC could expand its mandate to specifically cover clean energy projects, offering loan guarantees to reduce interest costs for Indigenous renewable energy developments. Programs like Smart Renewables and Electrification Pathways (SREPs) should continue prioritizing Indigenous partnerships.[82]

Capacity Building and Partnership Development: Investing in skills development through programs such as AICEI and Indigenous Power Workers initiatives will train the next generation of Indigenous engineers and technicians.

Conclusion

Indigenous and Métis communities in Alberta are demonstrating unprecedented leadership in the province's energy transition. However, significant barriers remain, including access to capital, regulatory constraints, and the need for enhanced policy support.

The timeline for transformation is ambitious but achievable: near-term diesel reduction by 2030, net-zero electricity grid by 2035, and full decarbonization by 2050. A clean energy future for Canada cannot be effectively realized without the respectful and substantive participation of Indigenous Peoples.

[82] The Smart Renewables and Electrification Pathways Program (SREPs), launched in 2021, is a federal program under Natural Resources Canada, and is a $4.5-billion program designed to support the deployment of grid modernization, energy storage and renewable energy technologies in every region of Canada, helping to grow the grid in a sustainable, affordable and reliable manner. The program also includes support for transmission and distribution infrastructure, and continues to support Indigenous-led clean energy projects. The program is currently expected to end March 31, 2036.

Chapter 4: Industrial Policy Transformation

Note to Reader: As explained elsewhere, this discussion on industrial policy and the "Core Five" is not intended to be prescriptive; instead, chapters 4 and 5 are offered as provocation for a conversation about how Alberta can address its looming revenue challenges, and do so while transitioning its energy options.

Chapter Summary

Alberta faces a critical economic challenge: the province relies heavily on oil and gas revenues, which account for 20-25 per cent of its budget in the 2024-2025 fiscal year. As global demand for oil declines and renewable energy rapidly expands, Alberta must diversify its economy or risk long-term economic and budget challenges.

The province can establish a **Revenue Review Panel**, redesign its industrial strategy, and invest in five key economic sectors: construction, manufacturing, housing, health care, and professional services. Agriculture and critical minerals can also play leading roles. This transition could take as much as 25 years and will require bold leadership, strategic investment, and the mobilization of Alberta's entrepreneurial talent.

CHALLENGE QUESTIONS: CHAPTER 4
? **Which** sectors of Alberta's existing economy, which new industries that are being developed, and which established sectors that require reinvestment, could replace the oil and gas sector when it declines in relevance within Alberta's economy?
? **What** are the critical elements of a new Industrial Policy in Alberta that are most crucial for the province's long-term economic well-being?[83]
? **What** role can a reimaged Heritage Trust Fund play in the provinces' long-term economic health?

[83] For a thoughtful examination of Alberta's Industrial Policy, including necessary recommendations around equity stakes in provincial investments, read Stake to Where the Puck is Going by the Alberta Federation of Labour, https://diversifyalberta.ca/alberta-should-use-industrial-policy-to-embrace-the-job-rich-energy-future/

KEY RECOMMENDATIONS

Immediate Action (2025-2030)
Strike a Revenue Review Panel to determine viable pathways for addressing long-term structural revenue problems, including guidance on a provincial sales tax.
Redesign Alberta's industrial strategy to align with emerging global opportunities through new policy priorities and investment changes.
Shift investment away from oil and gas toward health care, education, manufacturing, agriculture, renewable energy, and clean economy infrastructure such as provincial electricity interties.
Divert subsidies from oil and gas to renewable energy development, including wind, solar, geothermal, and storage.
Place a Heritage Premium of three per cent on all petroleum product sales when oil exceeds $30-$40 per barrel.

Medium Term Projects (2030-2040)
Develop a new economic narrative where Albertans see themselves as part of something bigger than an oil and gas economy.
Address the structural weakness in Alberta's economy by investing in other areas of strength and building on existing diversity.
Focus on The Core Five (housing, health care, manufacturing, construction, and professional services) for provincial and federal investment.
Re-imagine the Heritage Fund by investing the majority of oil and gas royalties to support the long term sustainability of the fund. Generate $50B annually by 2060.

Long Term Vision (2040-2050)
Reduce oil and gas to one per cent of provincial revenue by 2050.
Achieve 50 per cent+ GDP on contributions from The Core Five.
Maintain high living standards through economic diversification and sustainable development.

The Problem: Alberta's Structural Economic Weakness

Alberta has suffered from what economists refer to as "structural weakness" for over 50 years.[84] Moody's credit rating agency downgraded Alberta's credit rating in 2019, citing "structural weakness in the provincial economy that remains concentrated and dependent on non-renewable resources." The agency warned that Alberta's oil and gas sector generated high greenhouse gas emissions, leaving the province vulnerable to natural disasters such as wildfires and floods, which threatened Alberta's long-term economic health.[85]

The province generates a quarter of its revenue from oil and gas royalties, a commodity over which it has no control over the price. When oil prices crash, Alberta's budget plunges into deficit, threatening funding for hospitals, schools, and other essential services.

This over-reliance on oil creates four major problems:

1. **Economic instability:** Alberta experiences recessions when oil prices drop
2. **Federal and provincial tensions:** Alberta must fight for pipeline approvals and market access with both federal regulators and other provincial jurisdictions
3. **Labour challenges:** Workers struggle to retrain when oil jobs disappear, primarily due to automation
4. **Policy inflexibility:** The province cannot plan long-term budgets when revenues fluctuate wildly

The Energy Transition Is Happening Now

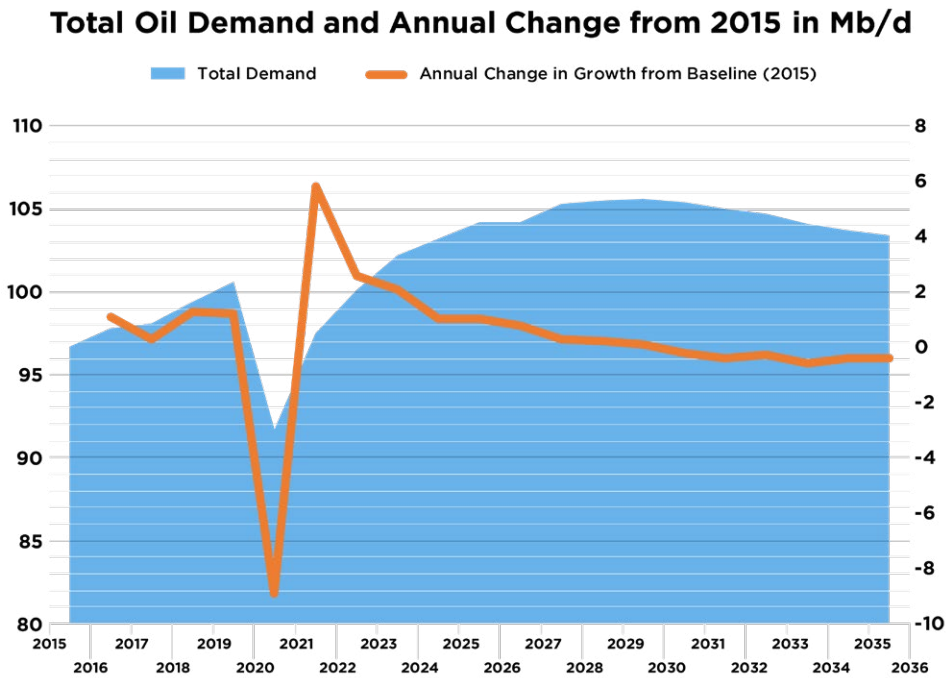
The global economy is shifting away from fossil fuels.[86] The International Energy Agency (IEA) projects that world oil demand will peak before or by 2030 as renewable energy rapidly replaces fossil fuels.[87]

84 Fraser Institute. "Here's How Smith Government Can Fix Alberta's Longstanding Fiscal Problem."

85 CBC. "Moody's Downgrades Alberta's Credit Rating, Citing Continued Dependence on Oil." https://www.cbc.ca/news/canada/calgary/moody-s-alberta-credit-rating

86 World Economic Forum. 2025. "Fostering Effective Energy Transition 2025." https://www.weforum.org/publications/fostering-effective-energy-transition-2025/

87 International Energy Agency. "Massive Expansion of Renewable Power Opens Door to Achieving Global Tripling Goal Set at COP28." https://www.iea.org/news/massive-expansion-of-renewable-power-opens-door-to-achieving-global-tripling-goal-set-at-cop28



(**Chart 2** © International Energy Agency. Declines in fuels for combustion — "others" are offset by petroleum feedstocks, which are expected to decline late in the 2020s. In the Chart Oil demand, 2017-2030, a conservative forecast shows a flattening in 2026 and the start of a slow, steady decline in 2030.)

The Solution: Transform Alberta's Industrial Policy

Learning from History

Alberta has diversified before. In the mid-1970s, oil accounted for 80 per cent of provincial revenues. Today, that figure stands at about 25 per cent — still a danger, but significantly improved.

The "Core Five" Economic Drivers

Alberta needs to focus its investment in sectors that consistently drive provincial GDP outside oil and gas. These could include a wide range of industries, but for *this report*, we've chosen the following:

1. **Housing** (currently 10.72 per cent of GDP): Includes amenity migration (facilities, trails, parks, sporting venues) and housing development
2. **Manufacturing** (8.59 per cent of GDP): Value-added production and processing
3. **Construction** (8.27 per cent of GDP): Infrastructure and building development
4. **Health Care** (6.09 per cent of GDP): Including telehealth, biotechnology, and medical device development
5. **Professional Services** (5.04 per cent of GDP): Engineering, architecture, and consulting

These five sectors currently account for 36.3 per cent of Alberta's GDP. With strategic investment, they could reach 47 per cent by 2040, providing a stable economic foundation.[88]

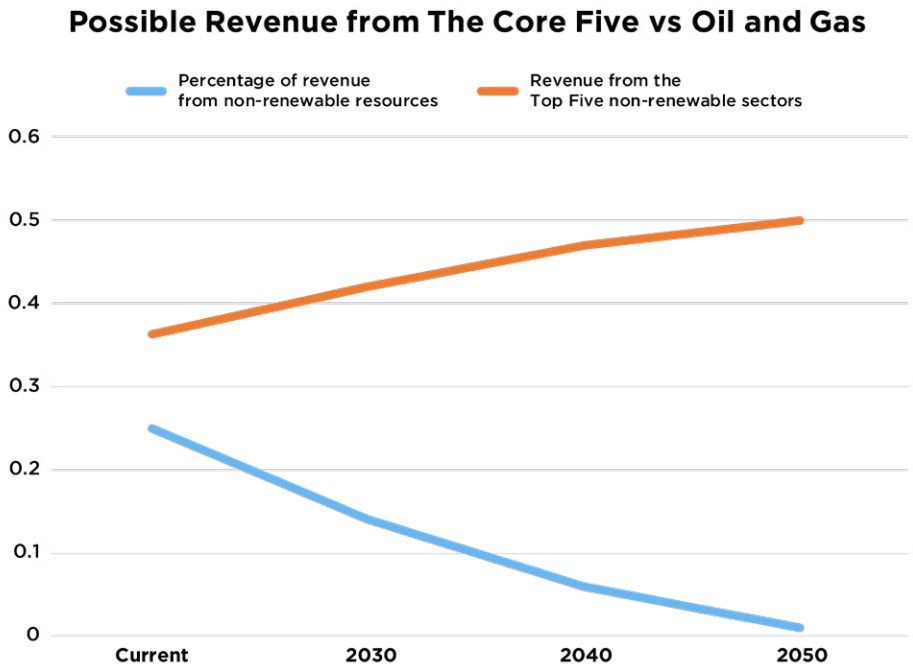


Chart 3 © Environmental Defence. Over time, to remain financially solvent, Alberta will need to develop new sectors of the economy that can drive GDP. The role of oil and gas will inevitably diminish over time; likely at a rate of one per cent per year for a few years, and then much faster as the energy transition reaches a tipping point. Data Sources: International Energy Association, Statistics Canada, US Energy Information Association, Implan, ICTC

Setting Realistic Targets

Alberta can establish measurable economic targets over 25 years. For example:

- **Reduce oil and gas revenue dependence** from 25 per cent today to 14 per cent by 2030, 6 per cent by 2040, and one per cent by 2050[89]
- **Increase the Core Five sector contribution** to 42 per cent by 2030, 47 per cent by 2040, and 50 per cent by 2050
- Seek ways to rebuild Alberta's agricultural economy and kick-start a green critical minerals industry.

88 "The Core Five" are an example of economic drivers that could provide Alberta with a boost to its GDP needed when oil and gas begin their projected decline around 2030. Each of these sectors have a strong position in the Alberta economy, and when combined with a revitalized agriculture industry, and the possible emergence of critical minerals (see chapter 9) as an economic factor in Alberta could provide a new diverse backstop for the province's overall financial wellbeing.

89 Alberta Business Council. "Alberta's Economy: Sector Snapshots, Oil, Gas and Mining." businesscouncilab.com/wp-content/uploads/2022/03/Albertas-Economy_Sector-Snapshots

Target	Current	2030	2040	2050
Percentage of revenue from oil and gas resources	25 per cent	14 per cent	6 per cent	1 per cent
Revenue from the Core Five industries	36.3 per cent	42 per cent	47 per cent	50 per cent

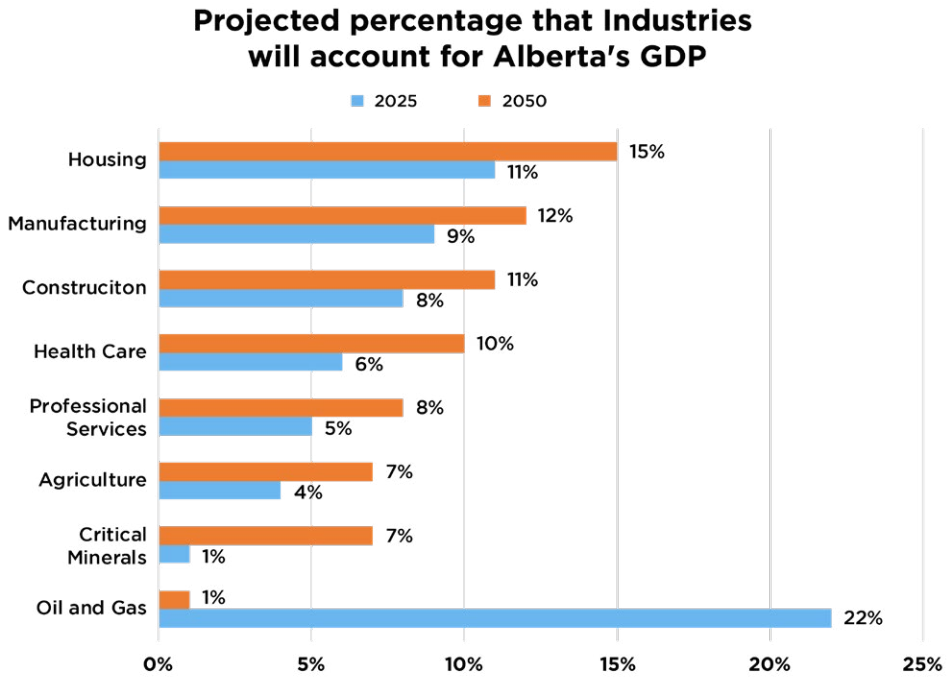


Chart 4. Assuming that our goal is to wean Alberta from oil and gas revenues completely by 2050, other sectors — The Core Five, plus agriculture and critical minerals — will need to be developed responsibly.

How Others Address Similar Challenges

Norway's Success Story

Norway provides the best example of how to manage oil wealth responsibly. The country planned to create a sovereign wealth fund worth $3.9 trillion by 2025, compared to Alberta's $30 billion Heritage Fund. Norway achieved this through high taxation on oil companies, strong government oversight, and consistent investment in the fund.

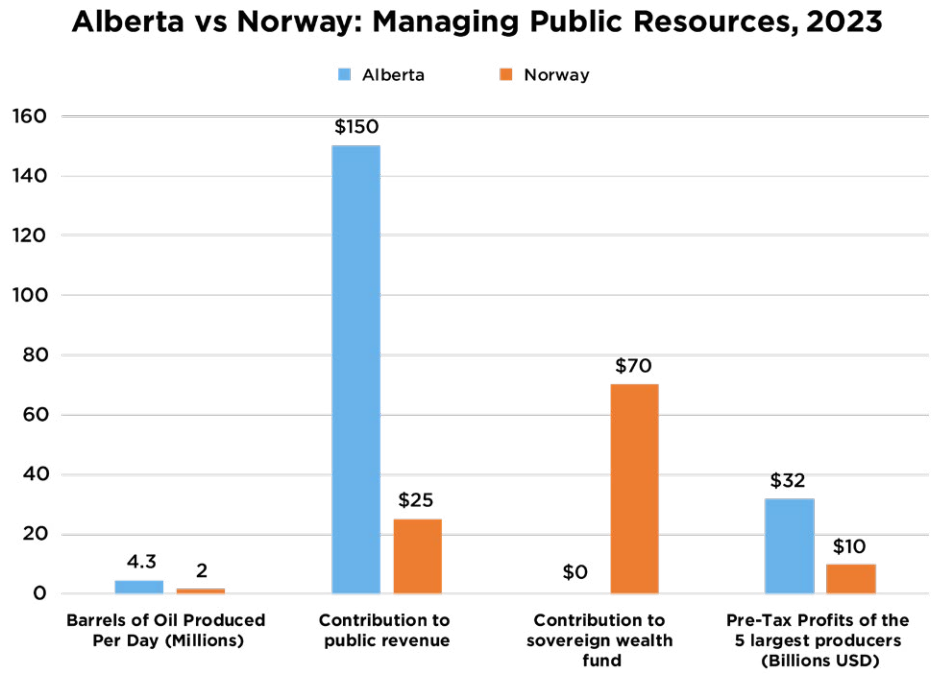


Chart 5. Sharp contrast between world-leading oil producers. Where Norway has invested much of its petroleum wealth in nation-building projects, long-term investments and government operations, Alberta has allowed wealthy corporations to take massive profits from a public resource. Data: Alberta Heritage Trust Fund, and the Norwegian Sovereign Wealth Fund

The Heritage Fund Long-Term Solution

Alberta established its Heritage Trust Fund in 1976, but stopped contributing after only 11 years. Alberta could revive the fund through[90]:

- A modest three per cent **Heritage Premium** on oil profits for 25 years
- Annual investments of 25-75 per cent of oil royalties (increasing over time
- Prohibition on new provincial oil and gas investments/subsidies/tax breaks starting in 2027

This strategy could grow the fund to $600 billion by 2060, generating $50 billion annually in dividends for economic diversification, green economy infrastructure, and public services.

[90] The Heritage Trust Fund recently received a $2.8 billion, and now has a market CAP of ~$30 billion, according to the CBC: https://www.cbc.ca/news/canada/edmonton/alberta-heritage-fund-budget-surplus

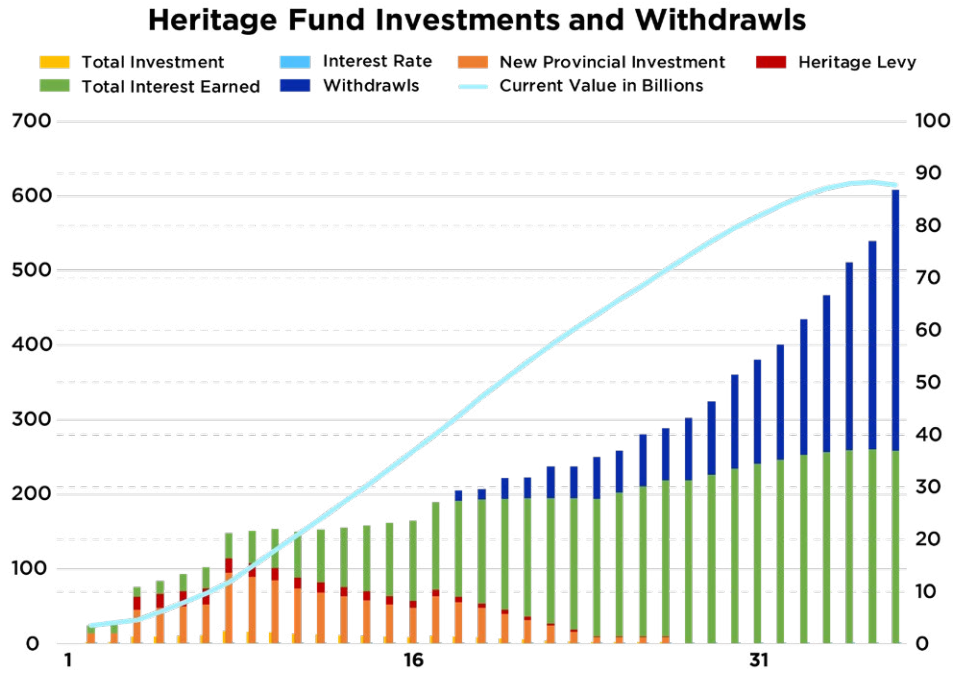


Chart 6 © Environmental Defence. With a modest investment from a Heritage Levy, and with annual investments based on a percentage of royalty payments, the Heritage Trust Fund could grow to a level where it supports significant dividends reinvested in economic development and diversification, infrastructure, climate resilience, and public programs such as healthcare and education. Chart data: historic investments in the Heritage Trust Fund, and projected investments, returns and withdrawals.

Implementation Strategy

Step One: Accept the Revenue Challenge

Alberta must acknowledge that relying on revenues from an uncontrollable, declining commodity — oil and gas — poses existential risks for our provincial budget.

Step Two: Determine Diversification Options

No single industry can replace oil and gas. Alberta needs a matrix of interlocking industries — some new, some expanded –to gradually replace its reliance on petroleum revenues. Determining realistic revenue options could be the work of the proposed Revenue Review Panel, which would evaluate all possible revenue options for the province.

Step Three: Pilot, Scale and Invest

The province should establish a cabinet-level secretariat to oversee industrial policy development, implement recommendations from the Revenue Review Panel, and redirect oil and gas subsidies to support renewable energy and diversification efforts.

Conclusion

The energy transition in Alberta will take 25 years and require strategic investment in the Core Five economic sectors, the re-vitalization of a robust Heritage Fund, and the development of new industries. Norway proves that oil-rich jurisdictions can build sustainable wealth through strong governance and long-term thinking.

Chapter 5: A Deep Dive into The Core Five

Chapter Summary

While Alberta's energy sector has been the cornerstone of its prosperity for decades, contributing approximately one quarter per cent of GDP (budgeted, 2025), the imperative for economic diversification has never been more urgent. Five key non-energy sectors — Housing & Rental (10.7 per cent GDP), Manufacturing (8.6 per cent GDP), Construction (8.3 per cent GDP), Healthcare (6.1 per cent GDP), and Professional Services (5.0 per cent GDP) — currently represent 38.7 per cent of Alberta's economy and hold the transformational potential to reach at least 50 per cent by 2050.

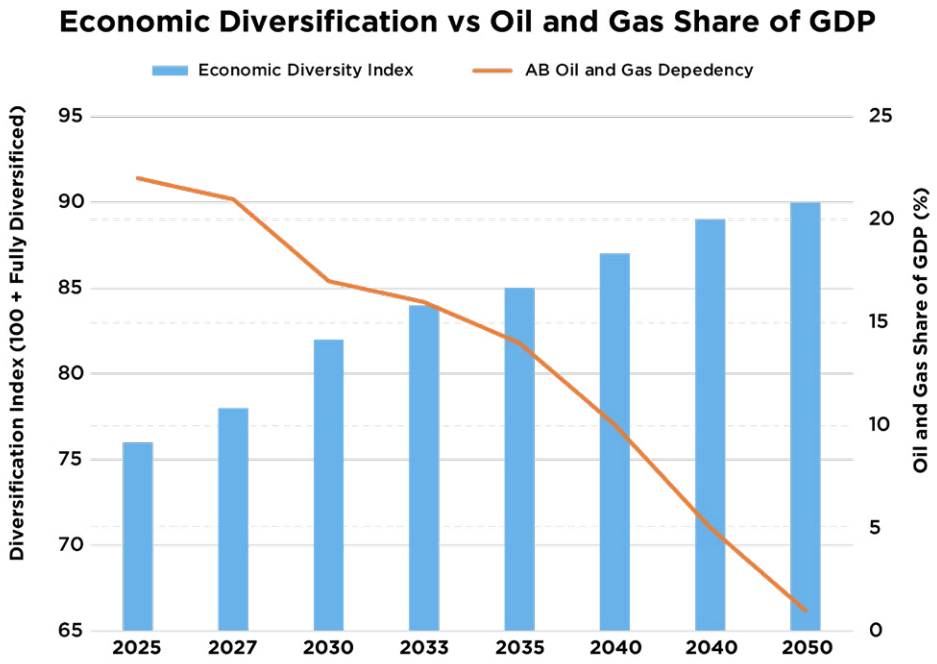


Chart 7 © Environmental Defence. It will be challenging one way or another, so choosing a managed decline for the oil and gas industry means making strategic investments in other sectors. Investing in The Core Five, along with agriculture and renewable energy, enables Alberta to enhance its long-term economic well-being, as measured by the Global Economic Diversification Index, over a 25-year transition period. https://economicdiversification.com/about-the-edi/. Additional reference data from the IMF, Business Council of Alberta, Brookings Institution and TRENDS Research: Economic Diversification to Face Global Oil Market Uncertainty. Chart by Claude.ai

Alberta welcomed a record 202,324 new residents in 2023, representing 4.4 per cent population growth — the highest among all Canadian provinces. The province's economy is forecasted to grow by 2.5 per cent in 2025 and 2.3 per cent in 2026, outpacing national growth rates.

CHALLENGE QUESTIONS: CHAPTER 5

- For nearly 50 years, Alberta governments have sought to diversify the provincial economy, with varying degrees of success. **What** are the top three investments – in capital, training, or regulations — that Alberta must make to achieve a long-sought-after fully-diversified economy?
- **What** areas of the economy are poised for growth in the near, middle and long-term future?
- **What** mindset is needed to encourage Albertans to start and invest in new areas of the economy, such as renewable energy, agri-food, advanced manufacturing or others?

KEY RECOMMENDATIONS

Immediate Action (2025-2030)

Establish the **Alberta Diversification Authority** to coordinate cross-sector initiatives and track progress toward the 50 per cent+ GDP target

Capitalize on the success of Alberta's Calling Program to attract and target skilled workers from other provinces and internationally

Create sector-specific investment tax credits, including research and development (R&D) incentives, clean technology adoption, and local content procurement

Develop integrated infrastructure planning connecting housing, transportation, and digital networks

Establish five sector-specific innovation hubs in Medicine Hat, Lethbridge, Calgary, Red Deer, and Edmonton with dedicated research and commercialization facilities

Medium Term Projects (2030-2040)

Implement mandatory net-zero building standards for all new construction by 2030

Create an "Alberta Manufacturing Renaissance Program," or similar undertaking, supporting advanced manufacturing and clean technology adoption

Develop integrated health innovation districts combining research, clinical care, and biotechnology development
Launch the Professional Services Export Initiative, promoting Alberta expertise in global markets

Long Term Vision (2040-2050)
Establish Alberta as North America's leading sustainable development hub, attracting international investment and talent
Develop next-generation workforce capabilities through continuous learning and adaptation programs
Build global recognition for Alberta's economic transformation model

How Each Sector Contributes to the Energy Transition

Sector	Contribution	Cautions
Housing and Rental Services	Housing is a foundational human right, and governments and private sector players are being encouraged to strengthen the supply of low and medium income housing. Building practices that strive for Net Zero standards and strong zoning laws to protect important cultural and natural features are essential.	Urban sprawl, the destruction of agricultural land and natural ecosystems, and unwalkable sub-divisions that price most Canadian renters and home buyers out of the market can introduce a host of challenges to the role housing can play in building Alberta's future economy.[91]
Manufacturing	What we manufacture and how we manufacture it are vital points of discussion for the energy transition. All new manufacturing facilities in Alberta should be 100 per cent powered by renewable energy, and focus on the production of materials, components and products needed to advance the global energy transition, providing us with key export opportunities. Existing facilities should be part of the commercial and industrial energy transformation outlined in Chapter 7.	Currently most of Alberta's large manufacturers are associated with the oil and gas industry, agriculture, chemicals, pipelines and cement. Each of these sectors contribute unabated GHGs as a result of their operations. A significant shift will be needed for Alberta's existing and new manufactures to compete in a low-carbon economy. Failure to do so will likely reduce the market share each of these industries enjoy. New manufacturers will need to be designed to be Net-Zero facilities.

[91] Environmental Defence's Mid Rise Manual is a valuable resource for those looking to expand the availability and affordability of housing while limiting its impact on agriculture, environment and other cultural values, including indigenous rights. https://environmentaldefence.ca/report/mid-rise-manual/

Construction	Like manufacturing, Alberta has a strong existing construction sector. Currently nearly half of all Alberta's construction, as measured by investment, is in the oil and gas sector. Once Alberta's renewable energy industry is back on level footing, a massive shift in the construction industry's focus can be expected, with the need for large-scale new renewable energy projects dominating the industrial construction sector.	Utilities, public administration and roads and warehousing accounts for the 2nd — 4th largest subsectors of the construction industry. Along with educational and health care facilities, these areas provide opportunities, along with challenges outlined in the Real Estate section above. Residential housing makes up a small portion of the construction sector by dollar value, but when measured by building permits (a common measurement) is much larger.
Health Care	Alberta has a very important, and growing health care technology and research industry, the expansion of which can provide goods and services that can benefit the lives of Albertans and others, but also create an export market for what global annualists, using the Compound Annual Growth Rate (CAGR) say is the world's 4th fastest growing industry.[92]	The same cautions exist for health care as they do for manufacturing, construction and housing. New builds must be Net Zero, and existing facilities such as hospitals and pharmaceutical research facilities can be retrofitted.
Professional Services	According to some, professional services such as data processing, cybersecurity, advertising and marketing, and global finance are among the top ten fastest growing economic drivers in the world. The post-COVID transformation of this sector means that many professionals work from home, reducing or eliminating commuting and its emissions, as well as reducing the need for costly office space.	As professional services include a wide range of industries, from architecture to law, accounting to engineering, this sector is very adaptable to any changes that occur in Alberta's economy over time.

92 Hubspot for Startups: https://www.hubspot.com/startups/reports/hypergrowth-startups/fastest-growing-industries

Housing & Rental Services: The Foundation Sector

Current Position: 10.7 per cent GDP → Target: 15 per cent GDP by 2050

Housing serves as Alberta's economic foundation, enabling all other sectors through strategic development and amenity migration. The sector's growth potential is substantial, driven by Alberta's population surge of 202,324 new residents in 2023, including 55,107 net interprovincial migrants primarily from Ontario and British Columbia.[93,94]

Housing costs remain approximately 50 per cent lower than in the Greater Vancouver and Greater Toronto regions, with an average home price of $465,198, compared to over $1 million in these markets.[95]

However, urban sprawl, lack of housing density targets, and associated infrastructure required to support massive housing development, can have a negative impact on biodiversity and climate change targets. Environmental Defence has prepared a previous report on housing densification, the recommendations of which must be followed for this sub-sector of the economy to meet its potential.[96]

Government Support Strategies

Infrastructure Investment: The provincial government's $8.6 billion commitment for up to 90 new schools over three years demonstrates the scale of infrastructure investment required.[97]

Regulatory Modernization: Implementing the existing Real Property Governance Act's (RPGA) centralized property inventory reduces red tape while increasing transparency.

The RPGA, according to Alberta Infrastructure, "ensures consistent handling of public property sales across the government. It also mandates that departments and consolidated entities offer the transfer of public property to Infrastructure prior to sale."[98]

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93 RE/MAX Canada. "Why is Everyone Moving to Alberta? A Housing Perspective." https://blog.remax.ca/why-is-everyone-moving-to-alberta-a-real-estate-perspective/

94 New Homes Alberta. "Invest in Alberta's 2025 Property Opportunities." https://newhomesalberta.ca/alberta-property-investment-opportunities-2025-guide/

95 Made in CA. "The Pros and Cons of Living in Alberta -- A Look in 2024." https://madeinca.ca/pros-and-cons-of-living-in-alberta/

96 https://environmentaldefence.ca/report/mid-rise-manual/

97 Alberta Infrastructure, Real Property Governance Act, https://www.alberta.ca/how-government-manages-public-property

98 Alberta Infrastructure, https://www.alberta.ca/how-government-manages-public-property

Under the previous decentralized model, policies for the disposal of land and buildings varied across government, making it challenging to resource its priority projects.

Affordable Housing Strategy: Creating public-private partnerships for Net-Zero, affordable, and rental housing development that addresses both social needs and market gaps.

Success Benchmarks and Metrics

Note: The targets set out for GDP growth for each of the Core Five are relative to one another and not absolute. They are also provided for illustrative purposes as an example of how Alberta can build on its existing strengths in key economic sectors to replace the role oil and gas plays as a driver of economic growth.

2025-2030 Targets	2030-2040 Targets	2040-2050 Targets
Annual housing starts: 25,000+ units (up from current 20,000)	Housing GDP contribution: 12-13 per cent	Housing GDP contribution: 15 per cent
Commercial space development: 5 million square feet annually	Net-zero new construction: 100 per cent by 2035	Carbon-neutral building operations: 100 per cent of commercial and residential stock
Average project approval time: Reduced from 18 to 12 months	Transit-oriented development: 60 per cent of new residential construction within 800m of public transit	Smart city integration: 100 per cent of new developments incorporate AI and smart grid technology
Population growth maintenance: 3-4 per cent annually	Population growth in Alberta could attract International investment up to $2 billion annually in Housing investment	Global Housing Investment Ranking: Top 10 globally for sustainable development
Housing affordability ratio: Maintain median home price at <4x median household income	Rental vacancy rate: Maintain a 3-5 per cent healthy market balance	

Manufacturing: The Value-Addition Engine

Current Position: 8.6 per cent GDP → Proposed Target: 12 per cent GDP by 2050

Alberta's manufacturing sector represents the province's most significant value-addition opportunity, with over 50 per cent of production currently linked to oil and

gas development and processing. The sector's evolution from traditional resource processing to advanced manufacturing and clean technology production positions it as a cornerstone of economic diversification.

The clean economy transition creates unprecedented opportunities in manufacturing. Alberta's petrochemical expertise translates directly to the production of advanced materials, including carbon fibre composites, specialty chemicals, and polymer innovations.

Government Support Strategies

Innovation and Technology Investment: Implementing resource & development tax credits and patent-box regimes rewards technological innovation while encouraging domestic production.

Local Content and Procurement: Establishing "Buy Alberta" procurement requirements for government and major industry projects creates guaranteed markets for local manufacturers.

Case Study: Battery / Energy Storage System (ESS) Manufacturing in Alberta

Alberta presents a compelling opportunity for establishing Canada's first dedicated industrial and commercial battery energy storage system manufacturing facility.[99] An Alberta-based facility focusing on containerized systems with a capacity of 500 kWh to 5 MWh could capture a significant market share by specializing in cold-climate optimization, with initial investment requirements of $500-750 million for an annual production capacity of 5 GWh (the power needed to light and heat 3.75 million homes).[100]

Success Benchmarks and Metrics

2025-2030 Targets	2030-2040 Targets	2040-2050 Targets
Manufacturing GDP contribution is 10 per cent	Manufacturing GDP contribution is 11 per cent	Manufacturing GDP contribution: 12 per cent
Clean Tech manufacturing jobs: 25,000 new positions	Advanced manufacturing facilities: 50 new major installations	Carbon neutrality: 100 per cent of manufacturing operations

[99] Alberta Electric System Operator (AESO). "Alberta's Power System in Transition." Accessed 2025. https://www.aeso.ca/future-of-electricity/albertas-power-system-in-transition

[100] E3. "Energy Storage Economics in Alberta." July 23, 2024. https://www.ethree.com/energy-storage-alberta/

Manufacturing exports: $15 billion annually (up from $12B)	International market penetration: 40 per cent of production exported	Global competitiveness ranking: Top 5 in North America for advanced manufacturing[101]
R&D investment: 3 per cent of manufacturing revenue	Automation and digitization: 80 per cent of facilities are incorporating Industry 4.0 technologies	Circular economy integration: 90 per cent waste stream utilization
Energy efficiency improvement: 20 per cent per unit production		Export revenue: $25 billion annually

Construction: The Infrastructure Enabler

Current Position: 8.3 per cent GDP → Target: 10 per cent GDP by 2050

The construction sector led Alberta's job growth with 12,767 new positions in the first quarter of 2024. With significant infrastructure commitments, including $8.6 billion for school construction and ongoing renewable energy projects worth billions, the sector's growth trajectory extends well into the 2030s.

The industry's transformation from oil-driven projects to diversified infrastructure development creates sustainable growth opportunities. Renewable energy construction, including wind farms, solar installations, and energy storage systems, provides long-term project pipelines. Green building retrofits, mandated by climate targets requiring four-six per cent of homes (approximately 63,500 homes/year) to be retrofitted annually, are expected to create sustained demand through 2050.

Advanced construction technologies, including Building Information Modelling (BIM), modular construction, and sustainable materials, position Alberta as a leader in construction innovation.

Government Support Strategies

Long-term Infrastructure Planning: Implementing multi-year capital project commitments provides stability to the construction industry while supporting broader economic development. Developing 10-year infrastructure master plans creates predictable workloads for construction companies while ensuring efficient project delivery.

[101] Currently Alberta does not enjoy a leadership position in advanced manufacturing, but a number of studies and reports suggest it can position itself for success. See InnoTech Alberta: https://innotechalberta.ca/services/advanced-manufacturing-and-fabrication-initiative-amfi-program/

Workforce Development and Immigration: Addressing the projected need for 5,100 additional workers by 2032 requires comprehensive workforce strategies. Expanding apprenticeship programs with guaranteed employment pathways addresses immediate skills gaps. Developing construction-specific training programs for Indigenous communities and women increases participation from underrepresented groups.

Innovation and Technology Adoption: Supporting the adoption of construction technology through pilot programs and tax incentives enhances productivity while minimizing environmental impacts.

Sustainable Construction Standards: Implementing mandatory green building requirements for government projects creates market demand for sustainable construction practices. Developing low-carbon material standards, including mass timber and recycled content requirements, positions Alberta as a leader in sustainable construction.

Success Benchmarks and Metrics

2025-2030 Targets	2030-2040 Targets	2040-2050 Targets
Construction GDP contribution: 9 per cent	Construction GDP contribution: 9.5 per cent	Construction GDP contribution: 10 per cent
Green building projects: 70 per cent of new construction meeting LEED Gold or equivalent	Net-zero construction: 100 per cent of new buildings	Carbon neutrality: 100 per cent of manufacturing operations
Workforce expansion: 15,000 new skilled workers	Automation integration: 50 per cent of projects utilize advanced construction technologies	Global technology leadership: Top 3 internationally for construction innovation
Project delivery efficiency: 25 per cent reduction in average completion times	Circular economy implementation: 90 per cent construction waste diversion	Prefabricated construction: 60 per cent of residential and 40 per cent of commercial construction
Safety performance: 30 per cent reduction in workplace incidents	Indigenous participation: 15 per cent of the construction workforce	Export services: $2 billion annually in international construction services

Healthcare: The Innovation Catalyst

Current Position: 6.1 per cent GDP → Target: 9 per cent GDP by 2050

Healthcare represents Alberta's most transformative diversification opportunity, combining essential service delivery with innovation-driven economic development.[102] The sector's foundation includes Canada's largest comprehensive cancer center and the $459 million Connect Care system, integrating 1,300 information systems across 400 facilities.

The biotechnology sector demonstrates significant growth potential, with Calgary home to over 120 life sciences companies ranging from startups to publicly traded firms.

Government Support Strategies

Research and Innovation Infrastructure: Expanding the Arthur Child Centre model to other specialties fosters research-clinical care integration across multiple health domains. Developing partnerships among Alberta Health Services, universities, and the private sector facilitates rapid technology transfer from research to clinical application.

Digital Health Integration: According to Alberta Innovates, leveraging the Connect Care system's data capabilities for artificial intelligence development and clinical decision support creates competitive advantages in the health technology sector.[103] Developing data governance frameworks enables responsible innovation while protecting patient privacy and ensuring transparency.

Workforce Development: Expanding medical education capacity through university partnerships addresses healthcare workforce shortages while building research capabilities. Developing specialized training programs in health technology, biotechnology, and medical device development creates skilled workforces for emerging sectors.

Regulatory and Policy Support: Streamlining approval processes for medical devices and health technologies reduces time-to-market while maintaining safety standards.

[102] Business Council of Alberta, https://businesscouncilab.com/advocacy-category/opeds/steps-to-transforming-heathcare-delivery-in-alberta/

[103] Alberta Innovates, Enabling Better Health through Artificial Intelligence (AI-Better Health) October 2, 2023 https://albertainnovates.ca/wp-content/uploads/2023/10/AI-Better-Health-Program-Guide_final-2.pdf

Success Benchmarks and Metrics

2025-2030 Targets	2030-2040 Targets	2040-2050 Targets
Healthcare GDP contribution: 7 per cent	Healthcare GDP contribution: 8 per cent	Healthcare GDP contribution: 9 per cent
Biotechnology companies: 200 active firms	Medical device exports: $2 billion annually	Global health innovation ranking: Top 5 internationally
Digital health adoption: 80 per cent of healthcare delivery incorporates digital technologies	Health innovation startups: 100 new companies	Precision medicine leadership: 100 per cent personalized treatment protocols
Research investment: $500 million annually in health research	Clinical trial capacity: 500 active trials	Carbon-neutral healthcare: Net-zero emissions across all facilities
International patient attraction: 10,000 patients annually	Health workforce expansion: 25,000 new healthcare jobs	Health technology exports: $5 billion annually

Professional Services: The Knowledge Multiplier

Current Position: 5.0 per cent GDP → Target: 8 per cent GDP by 2050

The professional services sector's productivity advantages enable rapid scaling without a proportionate increase in infrastructure investment. Calgary's record venture capital investment, outperforming Vancouver in the first half of 2024, demonstrates the sector's momentum and growth potential.[104]

Engineering and technical services build upon Alberta's energy sector expertise while expanding into renewable energy, environmental consulting, and sustainable development.

Geographic Distribution and Regional Development

- **Calgary Innovation District:** Leveraging existing financial services concentration and the emerging technology sector to create an integrated innovation ecosystem.
- **Edmonton Research and Manufacturing Hub:** Building upon university research capabilities and existing manufacturing infrastructure to create an advanced manufacturing and biotechnology concentration.

[104] Calgary Economic Development. "2025 Economic Outlook: Geopolitical Uncertainty Looms as Calgary Looks Ahead." https://www.calgaryeconomicdevelopment.com/newsroom/2025-economic-outlook-geopolitical-uncertainty-looms-as-calgary-looks-ahead/

- **Regional Center Development:** Smaller centers can specialize in specific sector components, benefiting from lower land costs and an available workforce.

Government Support Strategies

Education and Innovation Ecosystem: Strengthening STEM programs in universities and colleges ensures the development of a talent pipeline while supporting sector growth. The Innovation Catalyst Grant, supporting STEM graduates in commercializing technologies, creates bridges between education and entrepreneurship.

Digital Infrastructure Development: Implementing province-wide high-speed broadband, including in rural and Indigenous communities, enables the delivery of professional services across distributed networks.

International Market Development: Creating trade missions and market development programs promotes Alberta professional services in global markets. Developing mutual recognition agreements for professional credentials facilitates international business development and enhances global competitiveness.

Regulatory and Tax Context: Maintaining competitive corporate tax rates and streamlined business registration processes supports sector growth. Developing intellectual property protection frameworks encourages innovation while enabling commercialization.

Success Benchmarks and Metrics

2025-2030 Targets	2030-2040 Targets	2040-2050 Targets
Professional services GDP contribution: 6 per cent	Professional services GDP contribution: 7 per cent	Professional services GDP contribution: 8 per cent
Technology company growth: 300 active tech firms	Global service firms: 50 Alberta companies operating internationally	Global competitiveness: Top 5 internationally for the knowledge economy
Services exports: $3 billion annually	AI and advanced technology adoption	Carbon-neutral operations: 100 per cent digital, paperless business processes
Innovation investment: $1 billion in venture capital annually	Knowledge worker attraction: 50,000 new professional jobs	International revenue: $10 billion annually in services exports
Digital infrastructure: 100 per cent high-speed broadband coverage	Innovation ecosystem ranking: Top 10 in North America	Innovation leadership: 25 per cent of global patents in emerging technologies

Conclusion

Alberta's path to achieving 50 per cent GDP from the Core Five (as an example) by 2050 represents more than economic diversification — it embodies a fundamental transformation toward sustainable prosperity and global competitiveness. The five-sector strategy leverages Alberta's existing strengths while building new capabilities that position the province as a leader in the transition to a clean economy.

Integrating environmental best practices throughout the strategy ensures that economic growth contributes to rather than detracts from climate objectives. Achieving carbon neutrality across all five sectors by 2050 positions Alberta as a global leader in sustainable development, while creating competitive advantages in clean technology markets.

Chapter 6: Electrification

Chapter Summary

Despite possessing world-class renewable energy potential and briefly leading Canada's clean energy expansion, Alberta has imposed regulatory barriers that threaten its competitive position and limit its economic prosperity. This chapter presents scenarios to achieve 90-95 per cent renewable electricity by 2050, creating up to 400,000 jobs while saving Alberta households significant amounts of money annually.

The transformation requires significant investment, amortized over 25 years, of between two per cent and five per cent of Alberta's GDP. The private sector is expected to finance approximately two-thirds of the investments.

CHALLENGE QUESTIONS: CHAPTER 6
? **What** is the real reason for the Alberta government's attack on renewable energy, and what does it say about how prepared Alberta is for the energy future?
? As renewable energy becomes cheaper to install and operate, **how** can Albertans take advantage of this price difference in the energy marketplace?
? **What** investments in infrastructure and interties between provinces and states will advance Alberta's renewable energy advantage fastest?

KEY RECOMMENDATIONS
Immediate Action (2025-2030)
Repeal the renewable energy regulations and security deposit requirements, and start again with an approach that does not prejudice against wind, solar, and geothermal energy.
As a baseline for new system-wide energy regulations, accept the premise that all energy projects should be subject to the same high standards of review to protect the environment, human health, our economy, and our communities.
Review agricultural land restrictions that prevent renewable energy development in some zones and revise them to establish level-playing field regulations.
Expand net metering limits to enable distributed generation
Streamline Corporate Power Purchase Agreement approval processes

Medium Term Projects (2030-2040)
Establish clear, long-term renewable energy targets
Set a reinvestment policy that ensures profits made from oil and gas energy projects are reinvested into the electrification of the energy grid.
Aim to reduce Alberta's industrial, residential and commercial power consumption by 25 per cent.
Develop effective interties with other provinces and states and create a market for Alberta's renewable energy.

Long Term Vision (2040-2050)
Integrate all of Alberta's 40,000 agricultural properties into an electrification program.
Secure long-term investment for the province's electrification.
Complete a province-wide infrastructure modernization to accommodate electrification.

The Problem — Alberta's Big Energy Gamble

Alberta's electricity system remains dangerously dependent on fossil fuels, with 83 per cent of power generation coming from natural gas.[105] In 2024, Alberta experienced record electricity demand peaks of 12,384 MW during winter cold snaps and 12,219 MW during summer heatwaves, highlighting the system's strain under extreme weather events.[106]

The province currently consumes approximately 74 TWh of electricity annually, with industrial users accounting for 75 per cent of demand, transportation 10 per cent, commercial users 10 per cent, and residential consumers six per cent.[107]

The Scale of the Challenge

Alberta's electricity demand is expected to grow significantly over the coming decades. The Alberta Electric System Operator (AESO) projects that average

[105] Alberta Electric System Operator. "Market and System Reporting." Retrieved June 11, 2025. https://www.aeso.ca/market/market-and-system-reporting

[106] Alberta Electric System Operator. 2024. "Albertans Asked to Conserve Power to Minimize Potential for Rotating Outages." January 13. https://www.aeso.ca/aeso/media/albertans-asked-to-conserve-power-to-minimize-potential-for-rotating-outages

[107] Canada Energy Regulator. 2023. "Provincial and Territorial Energy Profiles." https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/provincial-territorial-energy-profiles/provincial-territorial-energy-profiles-alberta.html

hourly demand will increase by 26 to 44 per cent by 2043, driven by electric vehicle adoption, AI development, and building electrification. This translates to potential annual consumption of 140-160 TWh by 2050, or double today's usage.[108]

Sectoral Energy Consumption: Understanding the Stakes

Albertans use more electricity per capita than any other province in Canada. While residential and commercial electricity use is higher than in most other provinces, Alberta's use of electricity in petroleum product development sets it apart from other Canadian jurisdictions.

Residential Sector (six per cent of demand) Alberta's 1.8 million households consume 17,500 GWh annually, with the average home using 7,200 kWh per year. See Chapter 7 for a comparison of energy consumption between provinces.

Commercial Sector (10 per cent of demand) The commercial sector consumes 21,000 GWh annually. HVAC systems account for 45 per cent of commercial electricity use, while lighting accounts for 25 per cent, and equipment accounts for 30 per cent.

Industrial Sector (75 per cent of demand): Alberta's industrial sector is the largest electricity consumer, consuming 31,500 GWh annually, including energy-intensive operations such as oil sands, manufacturing, mining, and agriculture.

Getting to 160 TWh: *Gas or Renewables?*

The analysis of Alberta's two pathways to 160 TWh of electricity generation by 2050 reveals that the 90-95 per cent renewable transition pathway offers superior long-term benefits across all user groups, despite requiring significantly higher upfront investment ($113-152 billion vs. $38-55 billion for natural gas). For consumers, the renewable pathway is expected to deliver substantial annual savings of $320-$ 480 (about 25 per cent of current costs) per household by 2050.[109] The renewable scenario also provides enhanced energy security and improved air quality, which could yield billions of dollars in health benefits in Alberta. From an investment and producer perspective, the renewable pathway demonstrates clear financial superiority with project returns of 15-20 per cent compared to 8-12 per cent for natural gas plants.

[108] AESO, Long term outlook, 2024, www.aeso.ca/assets/Uploads/grid/lto/2024/2024-LTO-Report-Final.pdf

[109] Pembina Institute, Albertas Renewable Energy Advantage, https://www.pembina.org/blog/albertas-renewable-energy-advantage

The Policy Crisis: How Alberta Derailed Its Own Success

Alberta's renewable energy sector was thriving before government intervention disrupted progress. In 2023, the province accounted for 92 per cent of Canada's renewable energy expansion, demonstrating massive private sector confidence in Alberta's clean energy potential.[110]

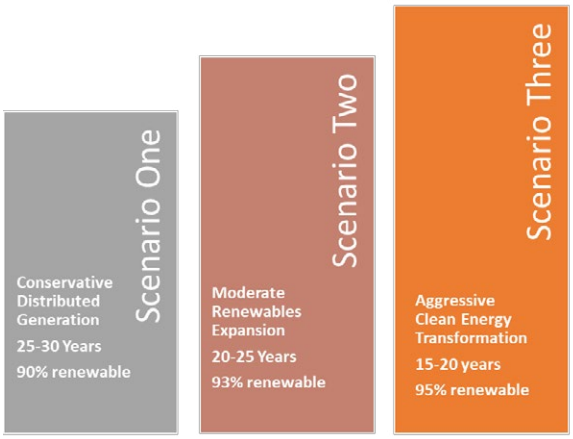
In August 2023, Alberta imposed a seven-month moratorium on renewable energy projects, followed by restrictive regulations in 2024 that fundamentally altered the investment landscape. According to the Business Renewable Centre, investment has been cut in half, and new renewable power generation has fallen from 1,704 MW in 2022, to just 52 MW in 2024.[111]

Three Scenarios to Energy Independence

Based on data from the Canadian Renewable Energy Association (CANREA), the Alberta Electric System Operator (AESO), and others, Alberta has three distinct pathways to achieve 90-95 per cent renewable electricity, each offering different timelines, investment requirements, and risk profiles.[112] All scenarios assume private sector leadership with strategic public investment limited to 33 per cent of total costs.

Scenario 1: Conservative Distributed Generation (25-30 years, 90 per cent renewable). *Total Investment: $195-245 billion over 30 years.*

This cautious approach emphasizes the adoption of distributed generation and gradual system transformation. The scenario prioritizes residential rooftop solar (2,500 MW across 250,000 homes), commercial building integration (5,000 MW), and substantial utility-scale development (38,000 MW wind and solar).



110 Pembina Institute, Wind and Solar Projects Cancelled at an Alarming Rate: https://www.pembina.org/pub/wind-solar-projects-alberta-cancelled-alarming-rate

111 Business Renewable Centre, "Deal Tracker" https://businessrenewables.ca/deal-tracker

112 Based on Canadian Renewable Energy Association (CANREA), Electricity Transformation Canada, https://renewablesassociation.ca/event/electricity-transformation-canada-2024/

Scenario 2: Moderate Renewables Expansion (20-25 years, 93 per cent renewable)
Total Investment: $285-345 billion over 25 years.

This balanced approach accelerates deployment while maintaining manageable risk levels. Enhanced residential deployment (4,700 MW), expanded commercial integration (7,200 MW), and aggressive utility-scale development (43,500 MW) create a robust, diversified energy system.

Scenario 3: Aggressive Clean Energy Transformation (15-20 years, 95 per cent renewable) *Total Investment: $365-425 billion over 20 years.*

This ambitious pathway positions Alberta as a global clean energy "superpower," achieving 95 per cent renewable electricity within two decades. Maximum residential deployment (6,000 MW), comprehensive commercial integration (9,600 MW), and massive utility-scale development (58,000 MW) create surplus capacity for interprovincial trade.

Sectoral Implementation Strategy

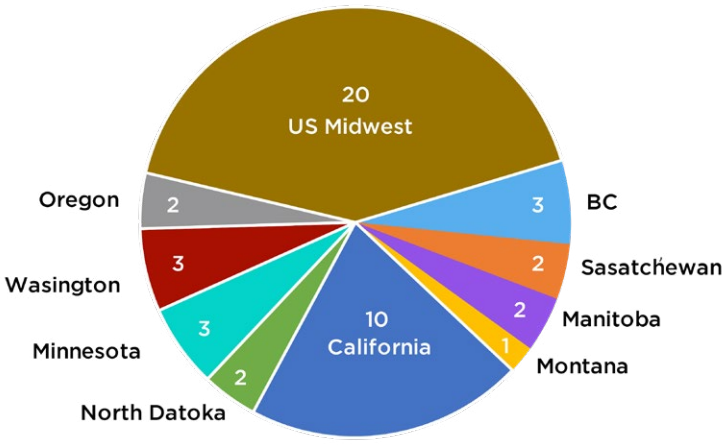
Residential Sector: Empowering Alberta Families

The residential sector represents the most immediate opportunity for renewable energy adoption. With 1.8 million households and exceptional solar resources, residential deployment can deliver rapid emissions reductions while providing direct economic benefits to families.

Investment and Returns: The residential sector's investment ranges from $18 to $38 billion across scenarios, with private financing covering 67 per cent of costs. By 2030, participating households will save $340-520 (half of current) annually on electricity bills.

Employment Impact: The residential sector transformation is expected to create 45,000-65,000 jobs, including solar installers earning $55,000-$75,000 annually and residential electricians earning $70,000-$90,000.

Who would Buy Alberta's Renewable Energy Surplus?
In Terawatt-hours (TWh)



Commercial Sector: Strengthening Alberta's Competitiveness

Alberta's commercial sector faces intense global competition, where energy costs increasingly determine business location decisions. Commercial sector investment of $28-67 billion creates immediate competitive advantages through building-integrated renewables, which reduce operating costs by 12-35 per cent over 20 years.

Industrial Sector: Leveraging Alberta's Competitive Advantages

The industrial sector presents both the most significant challenge and a notable opportunity. Alberta's 40,000 farms represent a massive opportunity for renewable deployment. Agricultural solar installations can generate 2,000-5,000 MW — enough to power a small city — while maintaining food production.

Oil sands operations and heavy industry can achieve 30-40 per cent reductions in electricity costs through the integration of renewable energy. This transformation is essential for maintaining competitiveness as global markets increasingly price carbon.

Critical Policy Reforms Required

Immediate Regulatory Changes

Level Playing Field: The energy sector in Alberta requires equal treatment in how energy producers are regulated, taxed, and subsidized. Since 1980, the Canadian and Alberta governments have funded the oil and gas sector with more than $300 billion.[113]

Agricultural Land Restrictions: The most urgent reform involves removing Class 1 and 2 agricultural land restrictions that prevent renewable development on some of Alberta's best wind and solar resources.[114] This is not without controversy, and groups such as Solar Alberta oppose such a reversal to avoid contention.[115] However, agrovoltaics have proven very successful elsewhere in the world and should be considered in Alberta.[116]

Net Billing Expansion: The current net metering limit of 1 MW for community solar projects must be expanded to 5 MW.[117]

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113 Environmental Defence Canada, https://environmentaldefence.ca/the-running-list-of-federal-fossil-fuel-subsidies-in-canada-in-2024/

114 Agriculture and Agri-Food Canada, Overview of Canada's agriculture and agrifood sector, https://agriculture.canada.ca/en/sector/overview

115 Heather MacKenzie, Solar Alberta, pers com. "Solar Alberta would not support this, as we do not favour green-on-green tension. However, we would encourage developers to consider agrivoltaics if using good land for solar. We do not need Alberta's best farm land to get to a net zero grid so this argument becomes a red herring."

116 CBC, How agrivoltaics is marrying food production with green energy in Alberta https://www.cbc.ca/news/canada/calgary/agriculture-calgary-alberta-solar-energy-green-1.7418978

117 Alberta electricity overview, https://www.alberta.ca/alberta-electricity-overview

The Smart Grid Foundation

A smart grid enables two-way communication between utilities and consumers, automatically optimizing energy flow based on real-time conditions. This technology is essential for integrating high levels of renewable energy while maintaining grid stability.[118]

According to AESO, Alberta's Energy System Operator, smart grid infrastructure requires a multi-billion-dollar investment across scenarios over 20 years, with benefits far exceeding costs. Advanced grid technologies enable higher renewable energy penetration while improving reliability and reducing operating costs.[119]

Implementation Timeline

Period	Implementation Targets
Years 1-8	Foundation building with smart meter deployment, policy framework development, and initial 800-1,200 MW of rooftop solar
Years 9-18	Mass deployment phase with peak employment of 25,000-35,000 workers
Years 19-25	System optimization with 8,000-12,000 permanent maintenance jobs

Financial Framework and Implementation Timeline

The implementation process is segmented into three phases: Foundation, Mass Deployment, and System Optimization. A commitment to electrification will require massive initial funding, with cumulative returns expected to start paying for future investments around year 18.

Household Savings: Residential participants achieve immediate bill reductions, growing to substantial lifetime savings. Early adopters in aggressive scenarios save over $30,000 in lifetime electricity costs while increasing property values.

Business Competitiveness Commercial and industrial participants achieve 12-40 per cent electricity cost reductions, improving competitiveness and attracting investment.

[118] Canadian Centre for Energy Information, Energy Fact Book, 2024-2025, https://energy-information.canada.ca/en/energy-facts/oil-natural-gas-coal

[119] AESO, Long-Term Transmission Plan, www.aeso.ca/assets/2025-AESO-Long-Term-Transmission-Plan.pdf

Financial Framework and Implementation Timeline

The implementation of the electrification process is segmented into three phases: Foundation, Mass Deployment, and System Optimization.

	Phase 1: Foundation (Years 1-8)	Phase 2: Mass Deployment (Years 9-18)	System Optimization (Years 19-25)
Workforce	Foundation building with smart meter deployment, policy framework, and initial investment in rooftop solar.	Mass deployment phase with peak employment of 25,000 to 35,000 workers.	System optimization with 8,000 to 12,000 permanent maintenance jobs.
Finance	Early investment focuses on developing the policy framework, initial deployments, and training the workforce. This phase establishes market confidence while demonstrating technical and economic viability.	The Mass deployment phase leverages economies of scale and supply chain optimization. Peak employment and investment occur during this period, accompanied by significant cost reductions resulting from learning curve effects.	The system completion and optimization phase focuses on grid integration, technology upgrades, and export development — employment transitions from construction to operations and maintenance.

- **The first eight years** focus on establishing industry and private sector partnerships, training the workforce, making adjustments to provincial and federal budgets and beginning the conversion to a renewable energy-based power grid.
- **The mass deployment phase** involves an economy-wide transition, implementing successful pilot projects and rapidly ramping up programs, employment opportunities and financing across the province.
- **The optimization phase** involves normalizing renewable energy systems, workforces, and maintenance financing.

Return on Investment Analysis

A commitment to the electrification of Alberta's domestic energy system will require massive initial funding, with cumulative returns expected to start paying for future investment around year 18.

Conclusion

Private sector leadership, combined with strategic public investment, can mobilize the required capital while minimizing public risk during the energy transition. Alberta's strong fiscal position and resource endowment make it an attractive destination for global clean energy investment.

The renewable transition represents the most significant economic opportunity in Alberta's history. Creating 280,000-400,000 jobs while saving households $1,500 annually by 2050, the transformation strengthens every sector of the economy while positioning Alberta for continued prosperity.

Chapter 7: Alberta Energy Efficiency: A Path to 25 per cent Energy Use Reduction

Chapter Summary

Despite being Canada's energy powerhouse, Alberta ranks dead last among all Canadian provinces in energy efficiency, according to the 2024 Canadian Energy Efficiency Scorecard.[120] This chapter presents a comprehensive plan to achieve a 25 per cent reduction in energy consumption across residential, commercial, and industrial sectors within 8-25 years.

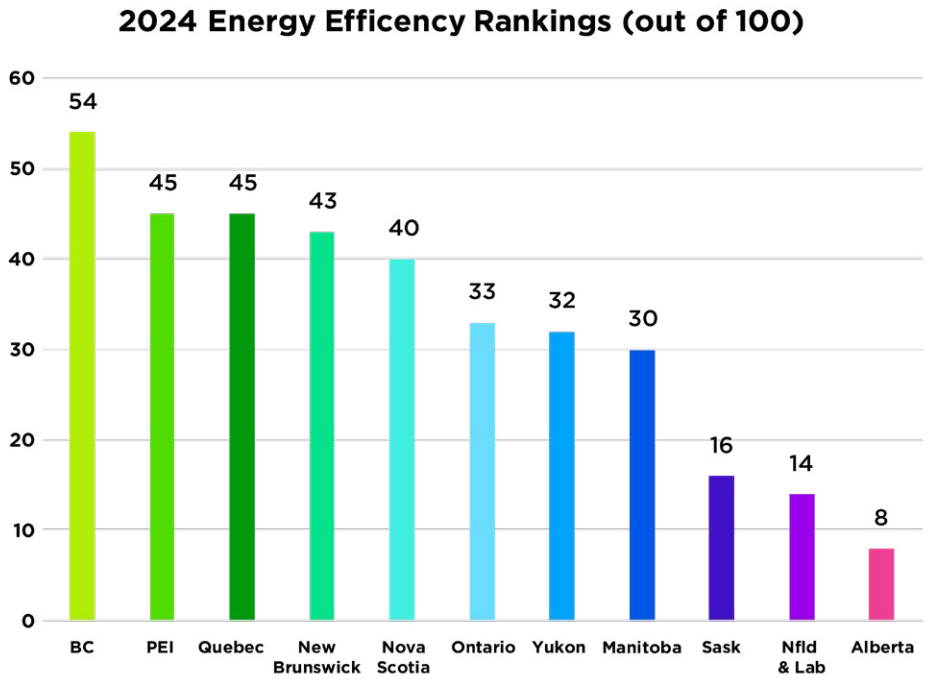


Chart 8: Data from Environment and Climate Change Canada and Natural Resources Canada illustrate one of the challenges Alberta will face transitioning; our energy use is the least efficient in the country. To transition, we need to conserve energy and replace what we are currently using — methane (natural) gas — with renewable energy.

By reducing energy consumption by 25 per cent over the next 8-25 years, Alberta will dramatically shorten the distance it needs to cover to achieve energy independence. The economic benefits extend far beyond energy savings. This strategy could create 50,000-100,000 person-years of employment, generate $15-30 billion in GDP contribution, and reduce greenhouse gas emissions by 25-40 megatonnes of CO2 equivalent annually.[121]

[120] Efficiency Canada. "Alberta Dropped to Last Place This Year." https://scorecard.efficiencycanada.org/energy-efficiency-alberta/

[121] Canadian Climate Institute. "The Benefits of Retrofits." https://climateinstitute.ca/retrofit-benefits

CHALLENGE QUESTIONS: CHAPTER 7

? **What** are the costs and benefits to business, agriculture, communities, and individuals of reducing energy consumption by 25 per cent in Alberta?

? Reducing our electricity use (per capita and overall) by 25 per cent means we don't need to build as much new generation. **Where** should we start?

? **What** role should electricity providers play in incentivizing energy conservation?

KEY RECOMMENDATIONS

Immediate Action (2025-2030)

Enact Comprehensive Energy Efficiency Legislation. Alberta must immediately develop and enact an Energy Efficiency Act, following the recommendations of the Pembina Institute and others.

Expand Municipal PACE Programs. The province should leverage its existing leadership in Property Assessed Clean Energy (PACE) financing by expanding these programs to all 341 municipalities.

Implement Utility Demand-Side Management. Alberta currently prohibits utilities from engaging in demand-side management activities, unlike most North American jurisdictions[122]

Advance Building Code Requirements. Alberta adopted the 2020 national model codes, but remains at the lowest performance tier

Launch Comprehensive Retrofit Programs. The government could establish large-scale retrofit programs targeting the province's 1.6 million households and 200,000 commercial buildings.

Medium Term Projects (2030-2040)

Achieve Net-Zero Ready Building Standards by 2035: Alberta will require new construction standards to meet net-zero energy-ready standards by 2040.

Establish a dedicated Energy Efficiency Coordination Office within Alberta Energy, led by a Deputy Minister-level coordinator reporting directly to the Minister of Energy or the Minister of the Environment.

[122] Demand-side management (DSM) programs are strategies and activities that encourage consumers to change their electricity usage patterns to reduce consumption or shift it to off-peak hours. This helps utilities by lowering costs, improving grid stability, and reducing the need for new power plants and infrastructure, while also benefiting consumers through potential bill savings and more reliable energy.

Establish an Energy Efficiency Advisory Council, comprising representatives from industry associations, environmental groups, Indigenous communities, and municipal governments.

Long Term Vision (2040-2050)
Complete Industrial Sector Transformation. The province will achieve comprehensive industrial energy management across all major facilities by 2045, supported by technology innovation funding and performance contracting mechanisms.
As a long-term vision, view the province's energy efficiency programs as a means of accelerating the shift towards renewable energy and economic well-being.

Sample Cost-Benefit Analysis

Investment Requirements by Scenario

Investments in energy efficiency yield positive returns within years, and individuals and businesses often see immediate financial benefits. Government incentives, loans, and deferrals can make it feasible for more Albertans to participate. Projected investments and cost savings have been drawn from Clean Energy Canada and the Canadian Climate Institute reports.

1. **Conservative Scenario (25-Year Implementation):** Total investment of $25 billion, generating $3.75 billion in annual energy savings. Simple payback period is 6.7 years, with a 20-year net present value of $48 billion.
2. **Balanced Scenario (18-Year Implementation)** Requires $35 billion investment but delivers $7 billion in annual energy savings, achieving a 5-year simple payback and $105 billion 20-year net present value.
3. **Aggressive Scenario (8-Year Implementation)** Requires $45 billion investment but achieves $11.25 billion in annual savings, delivering a 4-year payback and $180 billion 20-year net present value.

Summary of Return On Investment

Scenario	Implementation Timeline	Investment	Annual Province-Wide Savings	Payback Period	GDP Contribution
Conservative	25-years	$25 billion	$3.75 billion	6.7 years	$15 billion
Balanced	18-years	$35 billion	$7 billion	5 years	$22 billion
Aggressive	8-years	$45 billion	$11.25 billion	4 years	$30 billion

Sample Return on Investment Analysis

All three scenarios deliver substantial positive returns, with internal rates of return ranging from 15 per cent (Conservative) to 25 per cent (Aggressive). Energy efficiency investments demonstrate a multiplier effect of 2.5-3.5, meaning every dollar invested generates $2.50-$3.50 in economic activity.

The strategy will reduce provincial emissions by 25-40 megatonnes of CO2 equivalent annually, equivalent to removing 5-8 million vehicles from the roads.

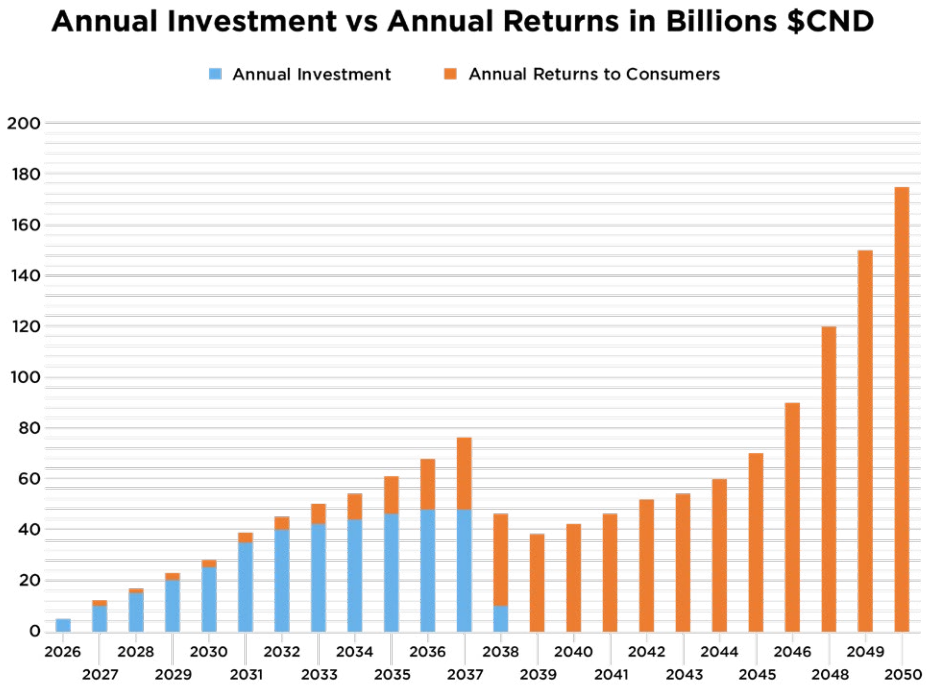


Chart 9: Environmental Defence. Using data available from a variety of sources, including AESO, illustrates that after a slow investment period, under a balanced scenario, annual returns kick in after about ten years and provide consumers with significant, long-term savings.

Implementation Framework

Alberta will establish a dedicated Energy Efficiency Coordination Office within Alberta Energy, led by a Deputy Minister-level coordinator. The province will establish an Energy Efficiency Advisory Council, comprising representatives from industry associations, environmental groups, Indigenous communities, and municipal governments.

Financing Strategy

Government Investment (30-40 per cent of total funding) The provincial government will provide funding through direct appropriations, bonds, and federal cost-sharing agreements.

Private Sector Mobilization Performance contracting mechanisms will enable large-scale private investment in efficiency improvements. Property Assessed Clean Energy (PACE) financing should expand significantly, offering long-term, low-interest loans secured by property tax assessments.

Conclusion

Alberta's transition from energy efficiency laggard to leader requires bold action, substantial investment, and sustained political commitment. The three scenarios present different pathways to achieve a 25 per cent reduction in provincial energy consumption per capita, enhancing economic competitiveness while meeting climate commitments.

The economic case is compelling: every scenario delivers substantial positive returns while creating tens of thousands of jobs and billions in economic activity.

Chapter 8: Alberta Workforce Transition

Chapter Summary

Alberta faces a critical turning point in its energy future. Over the next 25 years, the province must transform its large energy workforce from one focused on fossil fuels to one that leads in renewable energy. This chapter examines how Alberta can reduce oil and gas employment from approximately 135,000 workers today to fewer than 15,000 by 2050, while creating clean energy jobs.[123]

This sample strategy could require as much as $15 billion in total investment over 25 years, but promises fair treatment for every worker through guaranteed reemployment, comprehensive retraining, and strong community support.

CHALLENGE QUESTIONS: CHAPTER 8

? **How** would you feel if, after 10, 20, even 30 years, you were told that your job in traditional energy — oil, gas, coal — was ending? What would you need to feel optimistic about your future?

? **If** we asked you to estimate the size of Alberta's energy workforce at present, what would you say? How many people? What percentage of the overall workforce?

? **What** are the core skills that the future workforce needs in Alberta? How can we provide those?

KEY FINDINGS

Immediate Action (2025-2030)

Establish an **Economic Transition Authority**: Create an independent agency with initial funding and a legislative mandate spanning multiple election cycles to coordinate all transition activities and guaranteed reemployment programs.

Build Comprehensive Training Infrastructure: Establish 12 Energy Transition Hubs offering rapid certification programs (three-six months) with skills mapping for all 135,000 workers and direct pathways to renewable energy roles.

[123] MoKid Employment Services. "Alberta Oil and Gas Statistics 2024." https://mokid.ca/blogs/insights/alberta-oil-and-gas-employment-statistics/

Secure Industry Partnership Commitments: Require renewable energy companies to commit to hiring quotas, salary protection (at 85 per cent of previous wages), and shared funding mechanisms (with 40 per cent government funding, 35 per cent industry funding, and 25 per cent federal funding).
Implement a Worker Protection Framework: Mandate 18-month advance notice for layoffs, redirect two-six per cent of fossil fuel subsidies ($400 million annually) to training programs, and offer voluntary early retirement packages to 8,000 workers aged 55 and above.
Create Indigenous and Federal Partnerships: Ensure 25 per cent ownership stakes in renewable projects on traditional territories, secure federal-provincial funding agreements, and establish international technology partnerships with leading clean energy nations.
Medium Term Projects (2030-2040)
Launch Manufacturing and Technology Hubs: Establish wind turbine and battery production facilities in Edmonton, and transform Calgary into a clean energy financial hub, creating over 8,000 permanent jobs in manufacturing.
Deploy Massive Renewable Energy Infrastructure: Scale utility-scale wind and solar projects requiring 45,000+ operational workers, complete grid modernization for 80 per cent of Alberta, and build transmission infrastructure for US export markets.
Establish Advanced Clean Energy Industries such as battery manufacturing, wind and solar innovation, geothermal engineering, advanced critical minerals extraction and refining.
Scale Manufacturing and Technology Leadership: Establish Alberta as a North American clean technology production hub, create innovation incubators for worker-led startups, and launch international consulting services monetizing transition expertise.
Complete Major Workforce Transitions: Transition 56,250 additional workers through advanced training programs in smart grid management and energy storage, implement portable benefits systems, and ensure quality assurance meeting global standards.
Drive Regional Economic Diversification: Support community transformation in Fort McMurray and rural regions, create 25,000 construction and maintenance jobs, and establish performance monitoring systems for transparent progress tracking.

Long Term Vision (2040-2050)
Complete Oil and Gas Workforce Transformation: Transition final 37,500 workers while maintaining 15,000 in specialized roles (enhanced recovery, petrochemicals), and create 20,000+ decommissioning jobs for well closure and site remediation.
Achieve Clean Energy Leadership: Reach 93 per cent renewable electricity generation with reliable grid operations, establish global technology leadership in clean energy innovation, and develop next-generation manufacturing for export markets.
Build a Sustainable Export Economy: Generate substantial revenue through clean technology exports, electricity sales to North American markets, and international consulting services based on a successful transition model.
Complete Regional Economic Diversification: Ensure that all oil and gas-dependent communities have successfully transitioned into sustainable economic activities with integrated supply chains, from extraction to manufacturing.
Establish Long-Term Prosperity Model: Maintain competitive advantages in global clean energy markets, optimize workforce excellence through continuous education, and create lasting economic benefits for current and future generations.

Alberta's current workforce (summary)

By far, health care provides the most significant number of jobs in Alberta,about 350,000. Oil and gas (both conventional and in the oil sands) are in the middle of the pack, with about 135,000.

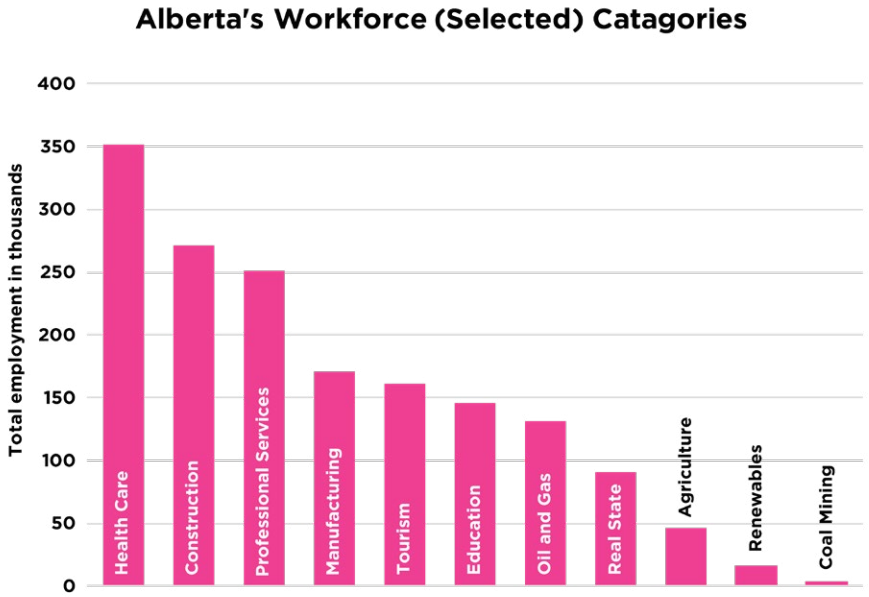


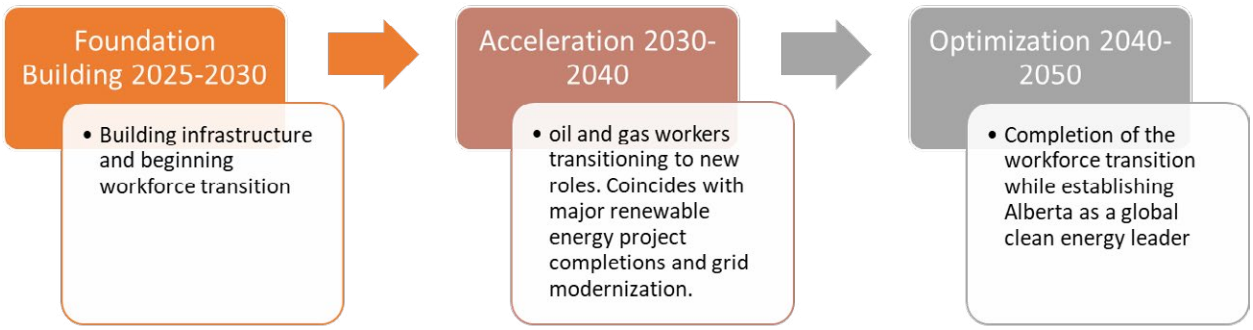
Chart 10: A summary of employment figures in Alberta; data from Statistics Canada 2024.

Current Energy Workforce in Alberta

Alberta's *entire* energy sector employs about 150,000 people directly. The oil and gas sector dominates, employing nearly 135,000 workers in specialized roles. Most earn between $75,000 and $150,000 annually and possess valuable technical skills and certifications.[124]

The coal industry employs 3,500 workers primarily in mining operations and power generation. Alberta's renewable energy sector currently employs 12,000 workers. Wind energy leads with 6,500 jobs, followed by solar with 3,200 positions.[125,126]

A Sample 25-Year Transition Plan for Workforce Transformation



Phase 1: Foundation Building (2025-2030)

The first five years focus on building programs and beginning workforce transition. Alberta could reduce oil and gas employment by 25 per cent (approximately 37,500 workers) while creating renewable energy capacity and developing training programs.

Key targets include transitioning 15,000 oil and gas workers to renewable energy roles, relocating 3,500 coal workers to renewable and storage technologies, and creating 18,500 new positions in the renewable energy sector.[127]

Phase 2: Acceleration (2030-2040)

The middle 10 years represent the most intensive transition period, with 50 per cent of remaining oil and gas workers moving to new roles. Goals include transitioning an additional 56,250 oil and gas workers and creating 120,000 new jobs in renewable energy. Attrition or early retirement could address up to 34,000 workers.

124 Government of Canada Job Bank. "Alberta Sector Profile: Mining, Quarrying and Oil and Gas." https://www.jobbank.gc.ca/trend-analysis/job-market-reports/alberta/sectoral-profile-mining-oil-gas

125 MoKid Employment Services; Alberta Oil and Gas Statistics 2024, https://mokid.ca/blogs/insights/alberta-oil-and-gas-employment-statistics/

126 Wikipedia, Economy of Alberta. https://en.wikipedia.org/wiki/Economy_of_Alberta

127 Centre for Strategic and International Studies, Is the Global Workforce Ready for the Energy Transition? https://www.csis.org/analysis/global-workforce-ready-energy-transition

Phase 3: Optimization and Completion (2040-2050)

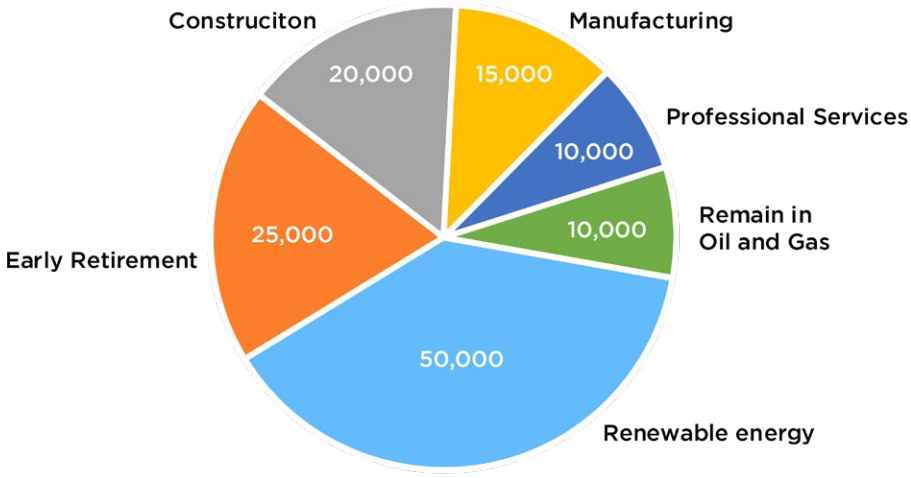
The final phase completes the workforce transition while establishing Alberta as a global leader in clean energy. The province will transition the final 37,500 oil and gas workers and create 80,000 additional jobs in advanced clean energy.

Skills Transfer and Training Requirements

Many oil and gas workers possess skills that can be directly applied to renewable energy roles. Electrical technicians can transition to solar panel installation within three to six months. Heavy equipment operators can adapt to wind turbine work with two-four months of training.[128]

Training costs vary by complexity: direct transfer training costs $3,000-$8,000 per worker, moderate retraining costs $15,000-$35,000 per worker, and extensive retraining costs $45,000-$75,000 per worker.

Where will Oil and Gas Workers Find Employment?



Early Retirement Strategy

As an example, early retirement programs will target workers aged 55-67 who prefer retirement over retraining. Analysis indicates that approximately 22 per cent of oil and gas workers (33,000 workers) are likely to choose early retirement. The total early retirement investment may reach $6.16 billion for 34,225 retirees over 25 years.[129]

[128] EE Power, Retraining Oil and Gas Engineers in Renewable Energy, https://eepower.com/tech-insights/retraining-oil-and-gas-engineers-in-renewable-energy/

[129] American Clean Power, Workforce Training and Education, https://eepower.com/tech-insights/retraining-oil-and-gas-engineers-in-renewable-energy/

Ensuring Fair and Equitable Transition

The cornerstone of Alberta's energy employment transition strategy would ensure every displaced energy worker receives a concrete job offer in renewable energy before their current position ends. Workers transitioning to renewable energy roles receive salary protection for three years. For example, if renewable energy salaries fall below previous earnings, government and industry partners could split the difference.

Conclusion

Alberta's 25-year energy workforce transition strategy represents one of North America's most ambitious workforce transformations. The creation of 419,000 clean energy jobs provides more than sufficient replacement employment, positioning Alberta as a global leader in renewable energy.

Success depends on maintaining consistency in the government's commitment to workforce transition, securing diverse funding sources, and ensuring worker voices guide program development. The success of the guaranteed reemployment program requires strong industry partnerships and predictable project timelines.

Chapter 9: Critical Minerals in Alberta

Introduction

Alberta possesses modest geological potential for critical minerals and rare earth elements (REEs), including lithium, nickel, cobalt, helium, and graphite.[130] The Alberta Energy Transition Study highlights the economic potential, projecting the creation of 170,000 cleantech sector jobs and a contribution of $61 billion to GDP by 2050. Mining for critical minerals, however, is still mining and comes with a host of social, cultural and environmental challenges.

Canada's overall critical mineral profile pales in comparison to China, Argentina, and Australia, who possess more than 90 percent of the world's recoverable supply.[131] By contrast, Canada has just three and a half percent of the lithium reserves.

Alberta's critical minerals sector represents a valuable but complementary component of the province's economic diversification strategy, with the potential to contribute $25-40 billion annually by 2050 while creating 48,000-85,000 jobs. However, unlike oil and gas extraction, critical minerals development must prioritize environmental excellence, Indigenous consent, and circular economy principles from the outset. The province's competitive advantage lies not in scale — given Canada's

130 Energy Regulator of Alberta, https://ags.aer.ca/our-science/mineral-resources/critical-minerals-potential

131 Natural Resource Canada. https://natural-resources.canada.ca/minerals-mining/mining-data-statistics-analysis/minerals-metals-facts/lithium-facts

modest 3.5 per cent share of global lithium reserves — but in establishing world-class standards for responsible extraction and processing.

Of these four major/economically critical minerals identified in the federal Critical Minerals Strategy, Alberta has both lithium and cobalt reserves. Further critical minerals in Alberta include:

- **Rare Earth Elements (REEs)** — Found in various locations across Alberta, including in coal deposits and tailings. These are essential for electronics, wind turbines, and electric vehicle motors.
- **Helium** — Alberta has some of the world's highest concentrations of helium in natural gas, making it a critical supplier for medical, aerospace, and technology applications.
- **Potash** — While more commonly known for fertilizer, potash is also considered critical for various industrial applications.
- **Phosphate** — Found in northern Alberta, important for fertilizers and various chemical processes.
- **Vanadium** — Present in oil sands and other deposits, used in steel production and energy storage batteries.
- **Titanium** — Found in heavy mineral sands, crucial for aerospace and defence applications.
- **Zirconium** — Also found in heavy mineral sands, important for nuclear applications and ceramics.

CHALLENGE QUESTIONS: CHAPTER 9

? **What** role can critical minerals play to create diversity in Alberta's economic future?

? **Can** Alberta lead the country and the world in the development of a circular economic model for the reuse of critical minerals?

? **How** much of Alberta's critical mineral wealth can be generated by simply re-purposing existing mining sites across the province?

KEY FINDINGS

Immediate Action (2025-2030)

Implement mandatory Free, Prior, and Informed Consent (FPIC) protocols for all critical mineral projects on traditional territories, with dedicated funding for Indigenous capacity building and environmental monitoring

Establish a provincial body to coordinate development, ensure ecological standards, and manage the transition from exploration to production while prioritizing circular economy principles
Complete detailed mapping of Alberta's critical mineral potential, prioritizing lithium extraction from formation waters and rare earth recovery from existing oil sands waste streams
Mandate that all new critical mineral projects demonstrate how they will contribute to a circular economy through waste stream recovery, recycling infrastructure, or end-of-life product management
Adopt world-class environmental protection standards that exceed current mining regulations, with mandatory impact assessments and community benefit agreements
Medium Term Projects (2030-2040)
Focus development on lower-impact extraction methods, particularly lithium recovery from oil and gas brines and rare earth extraction from existing tailings ponds
Develop in-province processing capabilities to capture value-added manufacturing opportunities while maintaining strict environmental controls
Establish research and development centers focused on clean extraction technologies, battery recycling, and critical mineral recovery from waste streams
Position Alberta as a reliable supplier of responsibly sourced critical minerals to North American clean energy manufacturers
Long Term Vision (2040-2050)
Establish Alberta as the world leader in responsible critical mineral extraction and circular economy practices
Create integrated supply chains from extraction through manufacturing to end-of-life recycling within Alberta
Ensure all critical mineral operations contribute to net environmental improvement through remediation of legacy sites and ecosystem restoration

Market Context and Global Demand

The global critical minerals market is experiencing unprecedented growth driven by the clean energy transition. The combined market value of key energy transition minerals more than doubled by 2040 in climate-driven scenarios, reaching USD

770 billion. UN Trade and Development projections indicate that by 2050, lithium demand could rise by over 1,500 per cent, with similar increases for nickel, cobalt and copper.[132] Canada has between one and five per cent of these minerals.

Alberta's Critical Mineral Assets and Potential

Alberta has potential for many critical minerals, including uranium, potash, and vanadium. Lithium is found dissolved in deep formation waters and in oil- and gas-field brines. Currently, there are no existing critical minerals mining operations in Alberta, but significant progress is underway with companies like E3 Lithium.

Economic Impact Projections (2025-2050)

Based on available projections, including data from the Energy Futures Lab, and the Government of Alberta, along with market analysis, Alberta's critical minerals sector could contribute modestly to provincial GDP over the next 25 years[133]:

- **2030:** $5-8 billion annually to provincial GDP (2-3 per cent of current GDP)
- **2040:** $15-25 billion annually to provincial GDP (5-8 per cent of projected GDP)
- **2050:** $25-40 billion annually to provincial GDP (7-12 per cent of projected GDP)

Economic Scale Comparison

A maximized critical minerals industry could represent a significant but complementary economic pillar to The Core Five and agriculture, if it meets the highest globally recognized standards for prior consent, environmental sustainability and community well-being:

Metric	Oil and Gas (Current)	Critical Minerals (2050 Potential)	Relative Scale
GDP Contribution	$120 billion (2023)	$25-$40 billion	20-35 per cent of O&G
Direct Employment	~135,000 jobs	48-85,000 jobs	35-60 per cent of O&G

[132] IEA, Outlook for Critical Minerals, 2024, https://www.iea.org/reports/global-critical-minerals-outlook-2024/outlook-for-key-minerals

[133] Energy Futures Lab, https://energyfutureslab.com/competitiveness-market-potential/

Employment Opportunities

Possible Direct Employment (2025-2050):

- Mining and Extraction: 15,000-25,000 jobs
- Processing and Refining: 10,000-20,000 jobs
- Advanced Manufacturing: 8,000-15,000 jobs
- Research and Development: 3,000-5,000 jobs
- Support Services: 12,000-20,000 jobs

Possible Total Direct Employment: 48,000-85,000 jobs by 2050

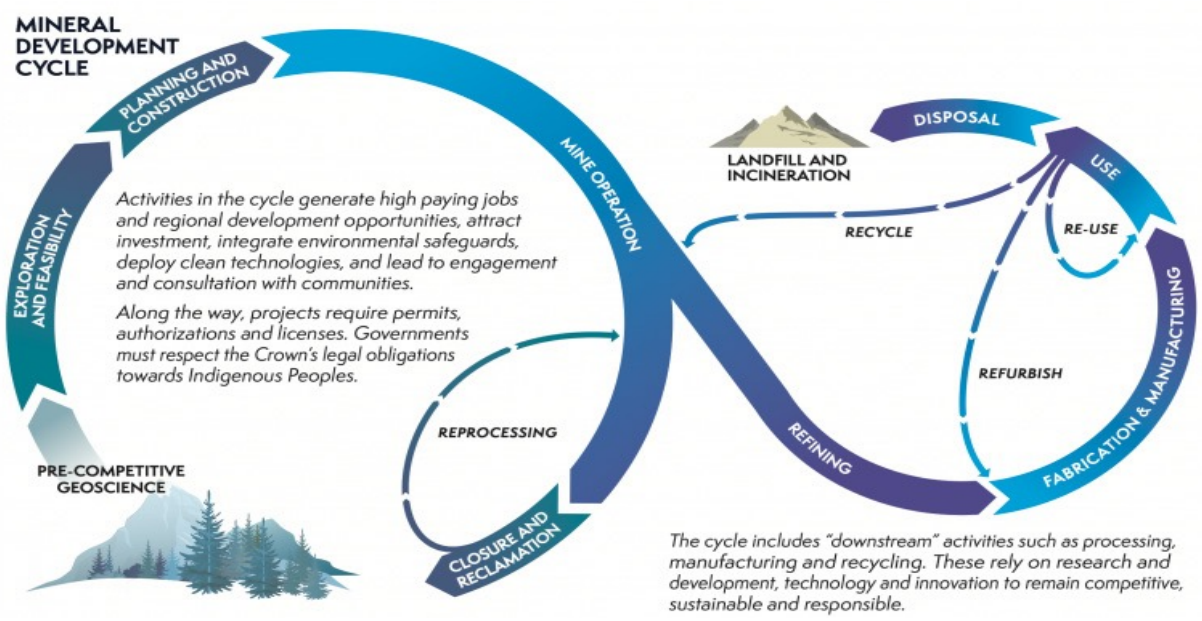


Illustration 2: © The Northern Miner, is an example of a circular economic model for critical minerals.

Developing a Circular Economic Model

Instead of funnelling considerable resources and time into extracting relatively modest new mineral reserves, Alberta and Canada can become a leader in a circular mineral approach that prioritizes human rights and prior informed consent from Indigenous peoples both in Canada and abroad, while creating jobs. With a focus on the entire life-cycle of critical minerals through reducing demand, extending product lifespans, recovering resources from waste, including waste rock and tailings, and embedding circularity in design, Alberta can become a world leader in sustainable mineral approaches.

There are many elements of a life cycle approach to mining that could include:

- Incentivize collective mobility solutions (public transit, active transport) over individual EV ownership through financial incentives and investments in mass

transit infrastructure.

- Reduce unnecessary consumption of electronics and appliances by promoting repair, reuse, and the use of second-hand markets.
- Mandate that goods containing critical minerals (e.g. batteries, solar panels, electronics) be designed for disassembly, repair and refurbishment, and recycling.
- Adopt international best practices, such as the EU's repairability scoring for electronics.
- Extended Producer Responsibility (EPR) requires companies to manage the full lifecycle of their products, including the collection and recycling of critical minerals at end-of-life.
- Develop a National Tailings Inventory to identify concentrations of critical minerals in waste sites.
- Prioritize the safe and environmentally sound remediation of abandoned mine sites over primary mining, with a view to re-mining minerals available in tailings and waste rock to reduce liabilities while unlocking value.
- Shift mining and processing toward renewable-powered, low-carbon systems.
- Support R&D in battery design, hydrometallurgy, bioleaching, and direct recycling of lithium-ion batteries, which can reduce energy inputs by up to 60 per cent compared to new extraction.

Environmental Baselines

If Critical Minerals mining is going to provide a component of Alberta's energy transition, it will need to be carried out following world-class environmental performance standards. The following baseline statements are drawn from "Canada's Critical Minerals Strategy—A Response to the Department of Natural Resources Discussion Paper" by Mining Watch Canada.[134]

Category	Mining Watch Canada's Recommendations
Climate Crisis	Governments should consider all available policy tools to tackle the climate crisis, and in the context of critical minerals, they need to be able to do more than pump money into subsidies and tinker with regulatory processes.
Leaving Deposits where sensitive	Not all deposits should be mined, and strict conditions need to be enforced on extraction where it is allowed.

[134] Mining Watch Canada: https://miningwatch.ca/sites/default/files/critical_minerals_strategy_critique_0.pdf

No Go Zones	No-go zones: Mining should be clearly ruled out for existing protected areas, plus identified areas of ecological, cultural, and economic importance. Rigorous community-based processes are needed to identify and delineate such zones, whether that is through land use planning or other methods.
UNDRIP and FPIC	Free, Prior, and Informed Consent (FPIC) and community consent: Commitments to implement the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), the Calls to Action of the Truth and Reconciliation Commission (TRC) and the recommendations of the Murdered and Missing Indigenous Women and Girls (MMIWG) Inquiry need to be honoured.
Impact Assessment	Impact assessment: Rigorous, mandatory assessment processes need to be implemented. There is no "fast track" that will not increase the risk of severe damage to ecosystems, as well as community engagement and social license.
Environment and Health Protection	Environmental and health protection: The highest regulatory standards need to be enforced to control water consumption and pollution, air pollution, worker health and safety, and especially tailings dam safety. If a mine cannot be built safely, it should not be built.

Conclusion

The race to extract and develop critical minerals is well underway. To provide the critical minerals necessary for the world's next phase of economic development, Canada and Alberta must define their role in the global market place. With just a few percentages of the most in demand critical minerals, that role will not just be as a producer, but as a leader in the development of a circular economic model that leads to the ongoing recycling and re-purposing of products that depend on critical minerals for their operation.

Success requires embracing innovative approaches such as lithium recovery from existing oil and gas brines and rare earth extraction from tailings, positioning Alberta as a premium supplier of ethically sourced materials for the global clean energy transition. Alberta's critical minerals strategy must complement rather than attempt to replace the economic scale of oil and gas, serving as one pillar within a truly diversified economy anchored by The Core Five sectors and revitalized agriculture.

Chapter 10: Growing Agriculture's Role

Chapter Summary

Alberta's agriculture sector presents a $47 billion investment opportunity over 25 years, which can triple its GDP contribution from $10.3 billion to $31 billion, while creating 150,000 new jobs and reducing greenhouse gas emissions by 35 per cent.[135] Agricultural electrification, coupled with the expansion of value-added processing and controlled environment agriculture, positions Alberta to reclaim its status as a diversified economic powerhouse.[136]

CHALLENGE QUESTIONS: CHAPTER 10
? **Can** the farming and ranching community lead programs to capture and sequester carbon in the soil, and electrify their energy-intensive equipment, while creating long-term value?
? **What** role can agri-food innovation — such as plant-based protein processing expansion or controlled environment vertical farming — play in revitalizing Alberta's agricultural sector?
? **What** is needed to meet the goal of increasing Alberta's agricultural workforce by 20 per cent?

KEY FINDINGS
Immediate Action (2025-2030)
Invest in the development of agri-food processing, marketing and distribution, building on Alberta's Agri-Food Investment and Growth Strategy
Embrace the work of groups such as Farmers for Climate Solutions to advance climate-friendly agricultural practices
Develop an electrification strategy for farm equipment (tractors)
Work with Alberta's 11 irrigation districts and their provincial organizers to electrify this infrastructure.

[135] Alberta Agriculture,Agri-food Investment and Growth Strategy https://www.alberta.ca/agri-food-investment-and-growth-strategy

[136] See Chart 11 on page 90 to benchmark projected growth in Alberta's agriculture and agri-food industries against other possible areas of growth in the economy.

Expand the province's Food Processing Development Centre and other food processing infrastructure.
Medium Term Projects (2030-2040)
Consider what role plant-based protein processing expansion can play to leverage the agri-processing tax credit to maximize benefits.
Expand plant-based processing and create a value-added grain processing program.
Create a Controlled Environment: A Development Strategy for Agricultural and Vertical Farming.
Partner with Olds College to continue to modernize Alberta's educational programs for agriculture.
Cross-pollinate with the electrification recommendations to establish a skills requirement evolution effort.
Long Term Vision (2040-2050)
Grow Alberta's long-term agricultural workforce by 20 per cent?
Increase agriculture's role in Alberta's economy to five percent of GDP by 2045.

Agriculture's Current Economic Foundation and Transformation Potential

Alberta's agricultural sector has experienced a profound economic shift over the past five decades. While agriculture once dominated the provincial economy, today it represents approximately three per cent of Alberta's GDP. Despite this relative decline, Alberta remains an extraordinary agricultural powerhouse, operating as Canada's largest cattle-producing region with 5.1 million head of cattle.

Climate Smart Agriculture

Agriculture in Alberta is experiencing dramatic impacts of climate change, through drought, heatwaves, and changes to insect pest habitats. Alberta Agriculture is beginning to address this through climate-smart agricultural practices. Water is an essential and increasingly scarce resource in Southern Alberta, where nearly a decade of drought conditions has left many farmers unable to raise crops.

Agricultural Electrification Opportunities and Timeline

Agricultural equipment electrification represents the most immediate opportunity for sector transformation. Currently, highly efficient electric motors operate at 90 per cent efficiency compared to diesel motors operating at only 30-40 per cent efficiency.[137]

Small to Medium Tractors (Under 200 horse power): These represent the most viable immediate opportunity for electrification. Electric tractors offer zero emissions, reduced noise, lower maintenance costs, and improved efficiency.

Irrigation Systems: Electric irrigation pumping systems represent agriculture's most established success story in the adoption of electrification.

Technology Barriers and Solutions

Large tractors and combines, which require 500-600 horsepower, present the most significant challenge for electrification. For these applications, hydrogen fuel cell technology could offer a viable pathway, but only at scale, and only if green hydrogen is employed.[138] Current battery technology restricts the operating time of electric equipment, but farms can address this by installing solar arrays or utilizing grid charging during off-peak periods.

Value-Added Processing and Investment Framework

Alberta's food processing sector operates through established facilities, including the Food Processing Development Centre (FPDC) in Leduc. The province can leverage its 12 per cent Agri-Processing Investment Tax Credit for companies investing $10 million or more in facility construction or expansion.

Protein Processing Expansion: Alberta's position as Canada's largest cattle-producing province, with $3.9 billion in annual beef exports, creates opportunities for expanded protein processing.

Plant-Based Processing Development: The growing global demand for plant-based proteins aligns with Alberta's strengths in crop production.

Controlled Environment Agriculture and Vertical Farming

Controlled Environment Agriculture (CEA) represents the most technologically advanced frontier in agriculture, offering year-round production capabilities immune to climate variability. Alberta companies like West Grow Farms demonstrate

[137] Tennessee Electric Cooperative Association. "Electric Farming Equipment is an Energy Trend to Watch." https://tnelectric.org/2020/08/25/electric-farming-equipment-is-an-energy-trend-to-watch/

[138] Read more on hydrogen in EDC's statement, found here: https://environmentaldefence.ca/2024/07/31/new-hydrogen-handouts/

commercial viability, supplying major retailers throughout the Edmonton region.[139,140]

Alberta has established strategic partnerships with international leaders. Invest Alberta's collaboration with NEXTON, a South Korean company operating a successful vertical farm, demonstrates the province's commitment to CEA advancement.

Olds College has launched Alberta's first Indoor Agriculture Certificate program, addressing the critical need for skilled CEA professionals.

Possible Economic Expansion Potential and GDP Growth Scenarios

Agriculture currently contributes $10.3 billion to Alberta's GDP, employing approximately 69,000 people.[141] It is possible for strategic investments to multiply this economic impact through three complementary pathways.

Growth Scenario Modelling

Scenario	GDP Contribution Growth. Start: $10.3B	Employment Expansion. Start 69,000 jobs	Total Investment Requires	Annual ROI
Conservative (25 years)	End: $22 billion	End: 125,000 jobs	$32 billion over 25 years	8 per cent
	+ 113 per cent	+81 per cent		
Moderate (20 years)	End $28 billion	End 165,000 jobs	47 billion over 20 years	11 per cent
	+172 per cent	+139 per cent		
Aggressive (15 years)	End: $31 billion	End 180,000	$58 billion over 15 years.	15 per cent
	+201 per cent	+161 per cent		

Sample Value Creation Mechanisms

Primary Production Enhancement: Electrification reduces operating costs while increasing productivity. Electric irrigation systems decrease energy costs by 35 per cent while improving water use efficiency. Precision agriculture enabled by electric equipment increases crop yields by 15-25 per cent.

139 Alberta Enterprise Group, https://albertaenterprisegroup.com/2024/03/05/controlled-environment-agriculture/

140 Old Collage, https://www.oldscollege.ca/news-events/news/2025/high-tech-farming-without-soil-or-sunlight-focus-of-research.html

141 Alberta Agriculture. "Agri-food Investment and Growth Strategy." https://www.alberta.ca/agri-food-investment-and-growth-strategy

Processing Multiplication Effect: Value-added processing typically generates three to five times the economic impact of raw commodity production.

Technology Innovation Premium: CEA operations generate revenue premiums of 200-400 per cent compared to traditional farming while enabling year-round production cycles.

DRAFT Employment Expansion Framework Projections

Direct Employment	Possible Jobs	Timelines
Agricultural equipment technicians	15,000	**70,000**
CEA facility operators	12,000	60,000 new jobs (40 per cent of total)
Processing facility workers	35,000	
Research and development professionals	8,000	
Total Possible Direct Employment Created	**70,000**	**2030-2040**
Indirect Employment Creation		
Construction and installation	25,000	55,000 new jobs (37 per cent of total)
Transportation and Logistics	18,000	
Equipment manufacturing and service	22,000	**2040-2050**
Financial and professional services	15,000	35,000 new jobs (23 per cent of total)
Total Indirect Possible Employment	**80,000**	
Total Possible New Jobs over 25 years	**150,000**	

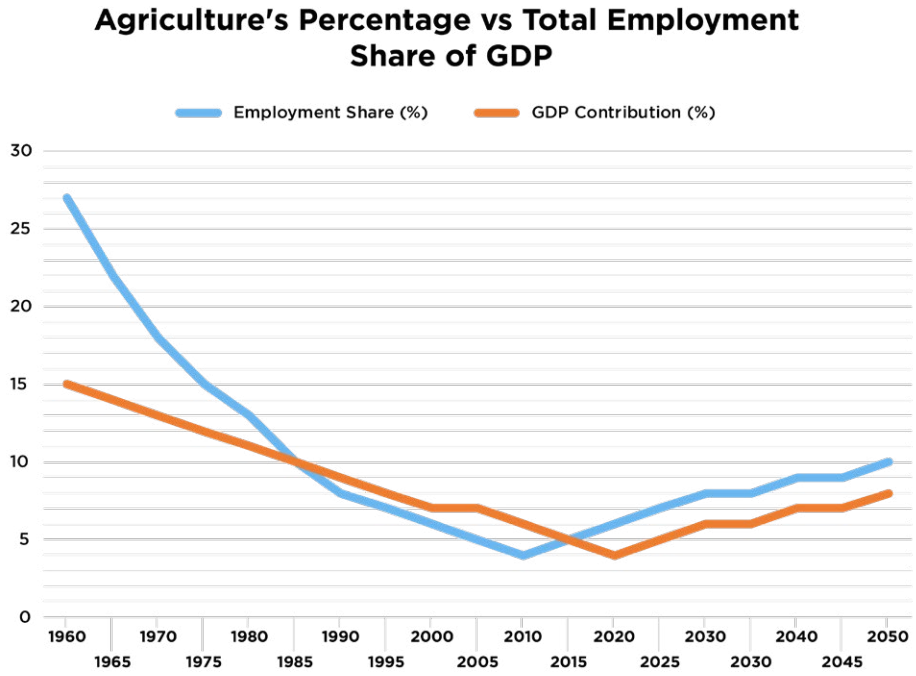


Chart 11: The relative "importance" of Alberta's agriculture industry has declined steeply as a result of changing markets, corporate consolidation and mechanization. Key data sources for this chart include Agriculture and Agri-Food Canada, Statistics Canada, and the Alberta Government. "Alberta labour force statistics: seasonally adjusted [2024], and Invest Alberta. "Investing in Agriculture & Farms: Business & FDI." November 9, 2021. A complete list of data sources and references can be found in the Research Notes, on page 111. Chart generated by Claude.ai.

Carbon Sequestration and Climate Benefits

Agriculture uniquely offers both emission reduction and carbon sequestration opportunities. Conservation cropping practices and land use changes in Alberta have already reduced approximately 18 per cent of the province's agricultural greenhouse gas emissions. With electrification-enabled precision agriculture, this sequestration capacity can be further amplified.

Draft Strategic Implementation Roadmap

- **Phase 1:** Foundation Building (2025-2030), which focuses on developing critical physical infrastructure and establishing market development initiatives.
- **Phase 2:** Scale-Up Acceleration (2030-2040) advances large-scale CEA facility construction, doubles processing capacity, and fosters comprehensive workforce development.
- **Phase 3:** Market Leadership (2035-2050) positions Alberta as a global leader through advanced technology demonstration projects, international technology export programs, and full electrification of the supply chain.

Sample Strategic Implementation Roadmap

Phase-Gate Implementation Strategy

	Phase One Foundation Building	Phase Two Scale Up Acceleration	Market Leadership
Gate 1	*Infrastructure Development*	*Technology Deployment*	*Innovation Leadership*
	• Rural electrical grid capacity upgrades • Equipment dealer network electrification training • Research facility expansion • Educational program development	• Medium tractor electrification programs • Large-scale CEA facility construction • Processing capacity doubling • Automation system integration	• Advanced technology demonstration projects • International technology export programs • Research Excellence Center Establishment • Global partnership development
Gate 2	*Market Development*	*Market Expansion*	*Economic Integration*
	• Small tractor electrification incentive programs • Irrigation system conversion support • CEA pilot project establishment • Processing facility modernization grants	• Export market development initiatives • Value-added product diversification • Technology transfer partnerships • International collaboration programs	• Full supply chain electrification • Circular economy implementation • Carbon-neutral agricultural production • Global market leadership positioning
Gate 3	*Policy Framework*	*Workforce Development*	*Sector Foresight*
	• Agricultural electrification regulatory framework development • CEA facility classification standards • Tax incentive program implementation • Interprovincial trade barrier elimination	• Specialized education program expansion • Industry-academic partnership strengthening • Immigration pathway development for skilled workers • Continuous training and certification systems	• Constant attention to market changes and trends • Agricultural integration into regional economies (Big Five) • Long-term labour development and retention • Carbon offset market domination

Conclusion

Alberta's agricultural sector stands poised to reclaim its position as a cornerstone of provincial economic prosperity while advancing the energy transition agenda. The convergence of agricultural electrification, precision farming technologies, and controlled environment agriculture creates synergistic opportunities unavailable to competitors.

Alberta can leverage its energy expertise and electrical grid infrastructure to become North America's leader in agricultural electrification, while establishing global leadership in CEA technology development and deployment.

Chapter 11: Alberta's Mid-Transition Guide

Chapter Summary

The mid-transition period, expected to span 2025-2040 for electricity and extend to 2050 for complete energy system transformation, presents unique challenges that require unprecedented coordination and strategic planning. This chapter examines how Alberta can maintain economic resilience during this transformative period, ensuring that essential services remain reliable while laying the groundwork for a sustainable financial future.

Understanding the Mid-Transition Challenge

The mid-transition represents a fundamentally different phase of energy system evolution than either the legacy fossil fuel system or the envisioned zero-carbon future. As energy systems researchers Emily Grubert and Sara Hastings-Simon define it, the mid-transition is "the period during which energy supply is constrained by a goal of reducing or eliminating greenhouse gas emissions and comprises fossil carbon-emitting systems and zero-carbon systems that both exist at sufficient scale to impose operationally relevant constraints on the other."[142]

Three critical features characterize the mid-transition:

1. **Mutual Constraint:** Both fossil and renewable systems limit each other's performance.
2. **System Interdependence:** The transitioning system relies on existing fossil infrastructure to support renewable deployment.
3. **Planning Complexity:** Traditional planning fails because it assumes optimization for either fossil or renewable systems, not the hybrid reality of mid-transition.

Alberta's industrial base adds another layer of complexity. With industrial demand accounting for nearly half of the province's power consumption, the province cannot afford reliability gaps that inefficient mid-transition coordination might create.

The Economics of Managed Transition

The economic challenge of mid-transition extends far beyond simple market dynamics. When the International Energy Agency projects global oil demand will plateau around 105.5 million barrels per day by 2030 before declining, Alberta's high-cost oil sands operations face a particularly vulnerable position.

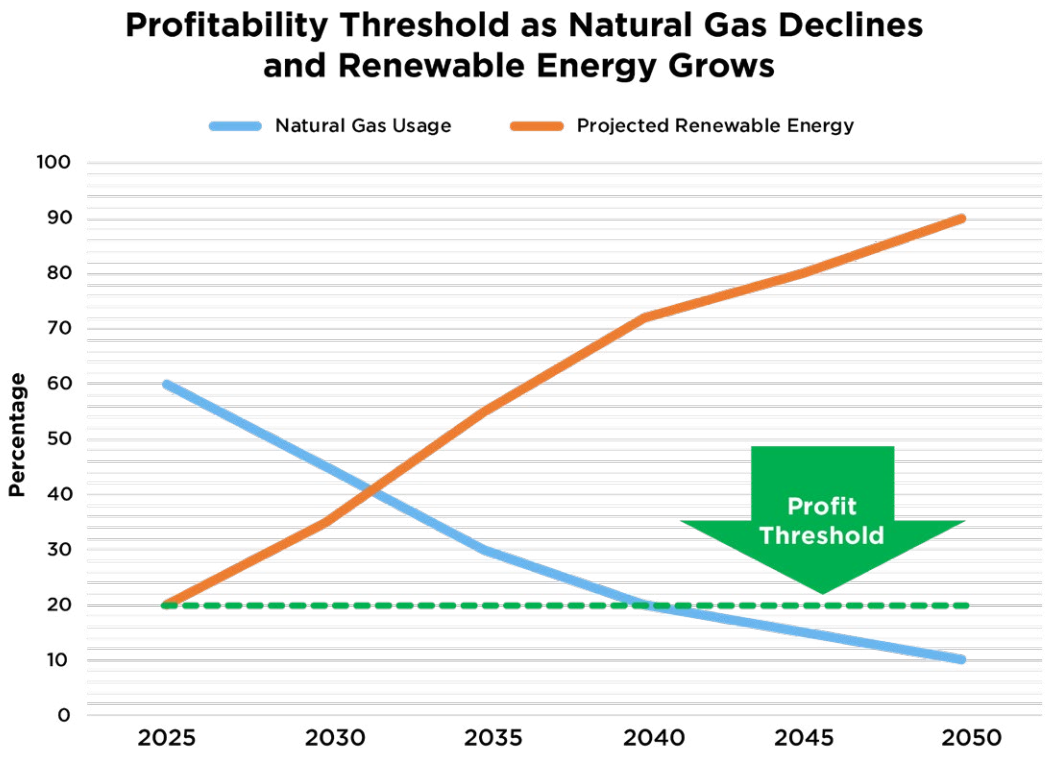
[142] Citation: Alberta Electric System Operator. 2024. "Alberta's Power System in Transition." https://www.aeso.ca/future-of-electricity/albertas-power-system-in-transition

The scale of Alberta's potential stranded assets globally exceeds USD 1 trillion, with the oil sands particularly exposed. Major international oil companies, such as Total, have already begun divesting their Alberta assets, identifying projects with "reserves beyond 20 years and high production costs, whose overall reserves may therefore not be produced by 2050.[143]"

However, the mid-transition creates a paradox: some fossil fuel infrastructure must continue operating beyond economic viability to ensure system reliability.[144]

Natural Gas: The Critical Bridge?

Natural gas infrastructure represents the most critical system that requires continued operation beyond profitability thresholds. Current decarbonization studies assume small amounts of natural gas will remain available for grid support under challenging conditions. However, this assumption presumes private companies will continue participating in a system with clear messaging of not only no growth expected, but active decline.



143 https://www.cbc.ca/news/canada/calgary/alberta-oilsands-total-writedown.

144 Grubert, E., and S. Hastings-Simon. 2022. "Designing the Mid-transition: A Review of Medium-term Challenges for Coordinated Decarbonization in the United States." WIREs Climate Change, e768.

Strategic Infrastructure Preservation

The mid-transition requires a fundamental shift in how Alberta approaches infrastructure planning. Rather than allowing market forces alone to determine which assets survive, the province must strategically identify and preserve infrastructure critical for essential services during the transition period.

Mapping Critical Assets

The first step involves a comprehensive mapping of energy infrastructure essential for public welfare:

- Natural gas distribution networks serving residential and commercial heating
- Gas-fired power plants provide grid stability and backup generation
- Transmission and distribution systems enabling renewable integration
- Industrial gas supply supporting manufacturing and petrochemical operations

Critical Decisions

The chart below is an example of several key indicators of economic health, mapped over a hypothetical timeline during a possible Alberta energy transition strategy. The data has been presented and referenced elsewhere in this document. It's presented here as an example only. Over the course of twenty-five years, key decisions must be made to ensure minimal disruption from transition-related changes to the economy and communities.

Early Phase Transition	Mid Phase Transition	Late Phase Transition
How do we shift from oil and gas royalties to other forms of financial well-being? What actions are needed to create conditions for success for the development of renewable energy? Are programs in place for the transformation of the province's labour force?	How do we ensure grid stability as renewable energy overtakes methane gas as the dominant source of power? Are essential services and environmental protections being strengthened? Are workers being supported during the transition?	What early investments are maturing that can be used to support long-term economic, cultural and environmental sustainability? In what unexpected ways is society adapting to transition, and how can we support long-term, positive decisions? What does the next transition look like?

Financial Sustainability Mechanisms

Traditional utility regulation assumes stable, long-term cost recovery through rate structures. The mid-transition disrupts this model, potentially leaving critical

infrastructure stranded before alternatives are fully deployed. Alberta needs new financial mechanisms:

- **Transition Service Obligations:** Similar to universal service obligations in telecommunications
- **Public Benefit Charges:** Dedicated funding streams to support infrastructure necessary for public welfare
- **Strategic Reserve Mechanisms:** Similar to strategic petroleum reserves for grid reliability

The Case for Selective Public Ownership

As private companies exit declining sectors, selective public ownership emerges as a necessary tool for maintaining essential services. This differs from traditional nationalization. Rather than taking over profitable operations, it involves public acquisition of assets that remain publicly necessary but privately unviable.

Natural gas distribution provides the most obvious case for potential public ownership. As Alberta's primary heating fuel, natural gas will remain essential throughout the transition period, even as overall demand declines. There will be a time when it's no longer profitable for private companies to manage the natural gas industry, but it will be needed for at least a decade after that point, so the government may need to create a crown corporation to manage it.[145]

Geographic Considerations

The spatial distribution of energy transition presents unique challenges. Oil and gas operations concentrate in specific regions, while renewable resources and manufacturing opportunities may emerge in other areas. Managing this geographic transition requires coordination of regional development strategies.

The province's experience with coal transition provides valuable lessons. The Coal Transition Taskforce facilitated dialogue among unions, employers, government, communities, and other stakeholders. Similar coordination mechanisms are essential for the broader energy transition.

Community Economic Development

Beyond individual worker transitions, entire communities built around oil and gas operations face economic transformation. The mid-transition period offers opportunities to leverage existing infrastructure and expertise for new economic activities:

[145] Science Direct, Imagining a future without fossil fuels: From mid-transition to net zero in a New England environmental justice city https://www.sciencedirect.com/science/article/abs/pii/S0306261925003940?dgcid=rss_sd_all

- **Industrial Transformation:** Existing industrial sites can be repurposed for clean energy manufacturing
- **Knowledge Economy Development:** Engineering and technical expertise developed in oil and gas can support clean energy industries globally

Financing the Mid-Transition

The financial requirements for Alberta's mid-transition extend far beyond traditional infrastructure investment. The province must simultaneously maintain declining fossil fuel systems, build renewable alternatives, support worker and community transitions, and manage environmental liabilities — all while facing declining resource revenues.

Managing Legacy Liabilities

Environmental cleanup costs present enormous challenges, with estimates ranging from $40 to $260 billion for oil and gas well remediation alone. The mid-transition period offers opportunities to manage these liabilities strategically:

- **Accelerated Cleanup Programs:** Using current high employment levels and available expertise to address orphan wells before industry capacity diminishes
- **Liability Bonding Reform:** Implementing full-cost bonding requirements ensures new developments pay cleanup costs upfront
- **Asset Sale Coordination:** As companies exit Alberta operations, coordinated asset sales can ensure adequate funding for cleanup

Conclusion: Navigating the Mid-Transition Successfully

Alberta's mid-transition challenge is unprecedented in its complexity, requiring coordination across multiple systems, sectors, and stakeholders over a multi-decade timeframe. Success will depend on recognizing that this period has unique characteristics requiring specialized policies, institutions, and metrics.

The key strategic elements for success include:

- **Explicit Mid-Transition Planning:** Recognizing that the transition period requires unique policies and institutions
- **Strategic Infrastructure Preservation:** Maintaining essential fossil fuel infrastructure beyond economic viability through selective public ownership or innovative financing
- **Coordinated Phase-In/Phase-Out:** Ensuring renewable deployment and fossil retirement proceed in sync to maintain reliability
- **Comprehensive Worker and Community Support:** Providing adequate resources and pathways for affected workers and communities

- **Robust Financial Planning:** Developing sustainable financing mechanisms that account for declining resource revenues
- **Effective Governance:** Creating institutions capable of managing complex interdependencies throughout the transition period

The mid-transition is not a temporary inconvenience to be endured, but a distinct phase that requires thoughtful design and active management. By embracing this reality and developing appropriate responses, Alberta can maintain economic resilience while building the foundation for a sustainable energy future.

Chapter 12: New Narratives for New Frontiers

Chapter Summary

Alberta's provincial identity, rooted in oil and gas prosperity, has become a limiting factor preventing it from realizing its true potential in a rapidly transforming global economy. Alberta must craft a new narrative about itself — one that honours its entrepreneurial spirit while pivoting toward innovation, technology, and sustainable prosperity.

Alberta's transformation begins with recognizing how deeply the province's oil-centric story has shaped its collective imagination. For decades, this narrative has served Alberta well, but it has now become a psychological prison preventing Albertans from recognizing the economic diversification already underway around them.

KEY RECOMMENDATIONS
Immediate Action (2025-2030)
Reframe Provincial Identity: Shift from "oil producer" to "energy innovator and problem solver"
Amplify Existing Diversification: Leverage Alberta's already-growing technology, life sciences, and creative sectors
Working with Indigenous communities, municipalities, community organizations, businesses, environmental organizations, service organizations, and other stakeholders, develop a consultation process to create a new narrative for the province that reflects its current and future values, aspirations, and opportunities.
Create an educational pipeline model that helps young Albertans envision careers outside of Alberta's traditional energy sector, that are fulfilling, contribute to society, and provide a good financial return.
Invest in Narrative Change: Fund campaigns that showcase Alberta's innovation ecosystem to residents and the world
Build on Entrepreneurial Heritage: Connect current innovation efforts to Alberta's historical resourcefulness
Create New Success Metrics: Measure prosperity beyond resource revenues to include innovation indicators

The Limiting Power of Old Stories

The narratives we tell ourselves shape not only how we see the world but what possibilities we can imagine. For Alberta, the province's dominant story has become both its greatest asset and its most significant limitation.

Alberta's current narrative centers on being "independent, hardworking and self-reliant people who, thanks to our ingenuity and entrepreneurial spirit, have been able to commodify a petroleum product — bitumen — and, as a result, have prospered." However, "Our story of ourselves as Albertans continues to get in the way of our ability to capitalize on that transformation."[146]

When a province's identity becomes inseparable from a single industry, it creates what economists call "path dependence" — a situation where past decisions limit future options.

The Reality vs. The Perception

The gap between Alberta's actual economy and its perception represents one of the province's most significant challenges. Research reveals that when young adults were asked to describe Alberta, their top response was the oil and gas sector, with estimates suggesting that between 40 per cent and 70 per cent of all jobs are directly related to oil and gas extraction. The reality is less than five per cent.

This misperception matters. As of March 2022, 95 per cent of Alberta's 88,000 vacant jobs were in sectors other than oil and gas extraction. The province faces a fundamental disconnect: it has thousands of opportunities in technology, life sciences, agribusiness, and creative industries, but these sectors struggle to attract talent because they're invisible within Alberta's dominant narrative.

The evidence of diversification is substantial. Alberta's technology sector has doubled to 3,000 companies in under four years, and Calgary ranks as the 28th tech talent hotspot in North America. 12,000 Albertans work in life sciences, and the province has led Canada in clean energy investment and renewable energy growth.

Learning from Political Culture Research

Dr. Jared Wesley's extensive research on Alberta's political culture provides valuable insights into how narratives shape possibilities. Wesley demonstrates how "the region's dominant political parties have used one key device — rhetoric — to foster and carry forward their province's cultural values or political code."[147]

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146 Legault, Stephen. "Opinion: The Hidebound Stories Albertans Tell Themselves Aren't Working Any More. Here's What a New Narrative Could Look Like." The Globe and Mail. https://www.theglobeandmail.com/opinion/article-the-hidebound-stories-albertans-tell-themselves-arent-working-anymore/

147 Dr. Jared Wesley, Common Ground, https://www.commongroundpolitics.ca/about

This research reveals both the power and the possibility of narrative change. Political codes aren't fixed; they evolve through conscious choices of leaders and citizens. Wesley treats "election campaigns as rituals that allow political leaders to renew their community's core values," suggesting that deliberate narrative work can reshape a province's sense of itself.[148]

A New Story for a New Era

Alberta needs a narrative transformation that honours its entrepreneurial heritage while embracing its innovative future. This new story could sound like: "Alberta, having pivoted from the trajectory of its past, is a place that invests in its people and its priorities of creating clean energy that the world needs… Albertans take to a new kind of frontier, harnessing the energy of our industries, our business leaders and our creative talents to become innovators once more."[149]

This narrative shift requires more than marketing. It demands a fundamental reframing of what makes Alberta successful. The province's greatest strength has never been oil itself –it has been the ingenuity, determination, and problem-solving capacity that allowed Albertans to extract value from challenging resources.

Three Case Studies: Learning from Successful Transformations

Singapore: From Trading Post to Innovation Hub

Singapore's transformation represents the most dramatic example of narrative-driven economic change. In 1965, Singapore faced "high unemployment, poor infrastructure, and an uncertain future." However, Singapore crafted a new story about itself as a high-skilled, innovation-driven economy rather than simply a trading post.[150]

The transformation required deliberate narrative work alongside policy action. Singapore's government "specially directed state funds" into key sectors while simultaneously promoting a new identity as a high-tech, globally competitive economy. The narrative emphasized human capital as Singapore's primary resource.[151]

Singapore achieved "an average rate of 9.2 per cent growth in the first 25 years" after independence. It ranked "highest in the 2020 World Bank Human Capital Index," proving that small jurisdictions can compete globally through strategic narrative work.[152]

148 Dr. Jared Wesley, Common Ground, https://www.commongroundpolitics.ca/about

149 Stephen Legault, *The Globe and Mail*, November 26, 2020. https://www.theglobeandmail.com/opinion/article-the-hidebound-stories-albertans-tell-themselves-arent-working-anymore/

150 Singapore Ministry of National Development. https://www.mnd.gov.sg/our-city-our-home/our-early-struggles#:~:text=When%20Singapore%20gained%20independence%20in%201965%2C%20it,Singapore%2C%20safe%20public%20housing%20was%20rapidly%20built.

151 Ibid

152 Ibid

Ireland: From Economic Stagnation to the Celtic Tiger

Ireland's economic transformation provides another compelling example of narrative-driven change. Through the 1950s, Ireland was "one of the poorest countries in Western Europe" with limited industrial development and heavy dependence on agriculture.[153]

The breakthrough came in the late 1950s with economist T.K. Whitaker's strategic plan, which fundamentally reframed Ireland's economic story. Rather than seeing itself as a peripheral agricultural economy, Ireland began positioning itself as an educated, English-speaking gateway to European markets for international investment.[154]

Critical to success was Ireland's ability to tell a new story about itself that emphasized its educated workforce, business-friendly policies, and strategic location. Ireland moved from being seen as economically backward to becoming a model for other European economies.

Scotland: Crafting a Transformation Strategy

Scotland's recent National Strategy for Economic Transformation offers a contemporary example of conscious narrative work. Recognizing that "achieving and sustaining high rates of growth... is traditionally associated with countries undertaking transition," Scotland has deliberately positioned itself as a transformation economy rather than a mature one.[155]

Scotland's strategy explicitly aims to be "recognized at home and throughout the world as an international benchmark for how an economy can transform itself, decarbonize and rebuild natural capital whilst creating more, well-paid and secure jobs."[156]

Key Lessons for Alberta

These successful transformations reveal several critical principles Alberta can apply:

- **Narrative Must Precede Policy:** Successful transformation began with leaders articulating a new story about identity and potential before implementing specific policies.
- **Build on Existing Strengths:** Singapore leveraged its trading heritage, Ireland its educated English-speaking population, and Scotland its innovation assets.

153 *RTE*, TK Whitaker's policies and Ireland's 1960s' economic awakening, https://www.rte.ie/brainstorm/2023/0711/1393908-ireland-tk-whitaker-economic-development-sean-lemass/

154 Ibid

155 Scottish Government, Scotland's National Strategy for Economic Transformation. https://www.gov.scot/publications/scotlands-national-strategy-economic-transformation/

156 Ibid

- **Set Transformational Goals:** Incremental change reinforces existing narratives. Breakthrough requires explicitly positioning the jurisdiction as undergoing a fundamental transformation.
- **Invest in Human Capital:** All successful transformations prioritized education, skills development, and attracting global talent.

Alberta possesses the same foundations that enabled these transformations: an educated population, entrepreneurial culture, existing innovation assets, and strategic location.

The Narrative Pipeline

Alberta's educational system can improve its preparation of the population for jobs and careers in the energy transition. Alberta could initiate a review of its career development programs to ensure that, at each level of the educational pipeline, Albertans are being prepared for new types of careers in a rapidly changing world.

Conclusion: The Path Forward

Alberta's dependence on oil and gas has become its greatest limiting factor. The path forward requires conscious narrative work at every level. Political leaders must speak about Alberta's technology sector with the same pride they show for energy production. Business leaders must celebrate the province's creative industries alongside traditional strengths.

The question is not whether Alberta can transform its economy — that transformation is already underway. The question is whether Alberta can transform its perception of itself, unlocking the full potential that comes with being Canada's self-proclaimed entrepreneurial capital in an era when entrepreneurship matters more than ever.

List of Advisors

More than seventy people participated in interviews contributing to the development of *New Frontiers*. Below is a partial list of advisors who participated in lengthy discussions. Please note that participation in these interviews does not necessarily mean they endorse all of the recommendations found throughout this report. Environmental Defence Canada thanks all of those who contributed to this work.

In addition to those who served as external advisors, subject matter experts at Environmental Defence Canada provided input, expertise and direction: Keith Brooks, Programs Director, Julia Levin, Associate Director, National Climate; Emilia Bellivieau, Senior Manager, Energy Transition; Alienor Rougeot, formerly Senior Manager, Oil and Gas, Alex Walker, Manager, Climate Finance.

Further, more than a dozen sitting MLA's, past MLA's and former cabinet ministers provided insight into the political feasibility of New Frontiers.

Partial List of Advisors

Steve	Bently	Director	Calgary Climate Hub
Sydney	Castro	Senior Policy Advisor on Climate Change	Métis National Council
Patrick	DeRochie	Senior Manager	Shift: Action for Pension Wealth & Planet Health
Jorden	Dye	Executive Director	Business Renewables Centre
David	Elske	AI & Community Innovation Lead	People and Planet Consulting
Wilson	Fink	Manager, Advisory Services	Viresco Solutions Inc
Todd	Hirsh	Former Vice-President + Chief Economist	ATB Financial
Hon. Ken	Hughes	Former Minister of Energy	Government of Alberta
Dr. Camille	Jasper, PhD	Professor of Economics	University of Alberta
Dr. Mohd Adnan	Khan, PhD	Professor, Chemical and Materials Engineering	University of Alberta
Dr. David	Laxer	Professor Emeritus of Political Economy	University of Alberta
Heather	MacKenzie	Executive Director	Solar Alberta
Phillip	Meintzer	Campaign organizer and co-founder	Coalition for Responsible Energy.
Joey	O'Brian	Chief Executive Officer	SustainAgro
Hon. Shannon	Phillips	Former Minister of the Environment and Climate Change	Government of Alberta
Darrin	Qualman	Former Director of Climate Crisis Policy and Action	National Farmers Union
Natalie	Southworth	Communications Advisor	Re: Climate
Dr. Jim	Standford, PhD	Director	Centre for Future Work
Dr. Melanee	Thomas, PhD	Professor, Department of Political Science	University of Calgary
Bill	Whitelaw	Chair	Canadian Society for Evolving Energy
Ed	Wittingham	Principal	Whit & Ham Consulting

Appendix A: Omission Costs and Risks

Pursuing a path towards energy transition, and subsequently economic diversification and growth, should be worthwhile to the province of Alberta based on the economic, social and environmental rewards outlined above. In the event, however, that the positive opportunities outlined in this report aren't convincing enough, here's a list of the opportunities that will be lost, and the risk that these omissions will cost Alberta should we fail to act.[157]

Issue	Cost / Risk Assessment
GDP replacement	Alberta stands to lose as much as one quarter of its existing GDP, and risk as much as $60B in future GDP associated with the clean energy economy, according to Clean Energy Canada.
Provincial budget	Between eight and 30 per cent of Alberta's budget is based on non-renewable resource royalties. Without a strategy to replace these dollars when oil consumption peaks around 2030, according to the IEA, Alberta's economic well-being will be severely jeopardized.
Health care and education	If Alberta fails to replace anticipated provincial revenues associated with oil and gas, according to the IISD, more than 15,000-20,000 healthcare positions could be lost, resulting in massive cuts to service, physician shortages, and lost surgical capacity, according to Stantis Health's 2024 summary report.[158] Rural emergency rooms would be at risk, more than $2B in prescription drug coverage would be lost, and mental health services would be severely impacted. A loss of 20 per cent of the province's $10B (2025) education budget would require the elimination of 8-12,000 teaching positions, throwing classrooms into chaos, according to CUPE and other labour unions. Massive classroom overcrowding, the cutting of special needs programs, and the collapse of new infrastructure and maintenance programs.
Employment	Employment per barrel of oil in Alberta is already plummeting due to technology and automation in the sector. Oilsands.com, Alberta's energy regulator, and others predict, based on meddling and forecasting by the IEA, that Alberta could lose 93 per cent of its current employment in oil and gas by 2050. Modelling shows 65,000 clean economy jobs could be added in Alberta by 2030, growing to 364,000 jobs by 2050, with manufacturing alone adding 80,000 jobs by 2030 (IEA), but that would require the Province to take its foot off the throat of that energy sector.

[157] References for the items in this chart are found throughout the New Frontiers document.

[158] Stantis Health, Rapid Recap 2024. https://santishealth.ca/insights/rapid-recap-albertas-2024-budget-focuses-on-health-care-education-and-safe-communities/

Trade	Assumptions around trade are more challenging to make. Still, according to data available from the Canadian Association of Petroleum Producers (CAPP), and assuming that the United States continues to focus on on-shore petroleum production and refining, the loss to Alberta's trade with its petroleum customers could be devastating and may result in total economic shock. The loss of tens of billions in GDP and provincial revenue, hundreds of thousands of jobs, and the significant out-migration of skilled workers could ensue.
Agriculture / Food Security	Agriculture is highly vulnerable to changing weather patterns, with farmers facing increased occurrences of extreme weather such as drought, flooding, and heat waves, as well as decreased soil moisture from longer and warmer summers, says Alberta's climate-smart agriculture program. In a recent poll, 76 per cent of farmers say they've been directly affected by severe weather in the past five years, naming climate change as the top challenge for the sector over the next decade, according to the University of Calgary. Alberta's top exports — canola, wheat, and beef — are all susceptible to the effects of climate change, with potential impacts on the province's viability as an exporter.
Water	Drought insurance payouts to Alberta's farmers and agri-businesses reached a record $326.5 million in 2023, more than tripling the payouts from the 2021 drought, according to Agri-Food Canada. Climate change impacts are clearly seen in water resources, with increasing air temperatures leading to snow melting earlier in spring, and glaciers melting quicker, which is particularly concerning as glaciers are very important for water availability in late summer when rivers are at their lowest flows, says the Alberta WaterPortal. Climate Change Impacts on River Systems and Water Users — Alberta's iconic glaciers are receding at an alarming rate due to rising temperatures, impacting not only freshwater availability but also unique habitats that depend on glacial meltwater.
Disasters (Direct)	Based on data from the UNHCR, NOAA, and Nature, and extrapolated for Alberta's unique risk to climate disasters, without adequate mitigation and adaptation, the province *may*, by 2040, face annual climate-related costs of 400-600 additional deaths (air pollution, extreme heat, disasters), 30,000-70,000 temporary displacements, and severe mental health, economic, and social disruption affecting 10-15 per cent of the population. These impacts will be concentrated in vulnerable demographics and fire-prone regions, creating lasting community trauma and economic displacement that could fundamentally alter Alberta's social fabric.

Disasters (Sunk Costs)	Following devastating wildfires in Jasper, and record-breaking hailstorms in Calgary in 2024, demand for disaster risk reduction support has increased according to Environment and Climate Change Canada's 2025-26 Departmental Plan. Alberta faces risks to its water supply, quality, and storm water and/or wastewater infrastructure due to climate change, with increased floods threatening stormwater and wastewater infrastructure as they can damage physical infrastructure and disrupt water treatment. Warmer winters are expected to have negative impacts on winter-road construction and maintenance costs, reducing the reliability and operating season length of winter roads, according to the Environmental Law Centre. Costs will likely scale significantly higher for Alberta, when compared to other provinces, potentially reaching several billion dollars annually when considering the national projection of $78-101 billion by 2050 and Alberta's disproportionate exposure to climate risks.
Stranded Assets	Alberta could add another 100,000 oil and gas wells between 2025 and 2050, according to the Narwhal. At the current rate and ratio of abandonment, Albertans could be on the hook for half a trillion in remediation costs before the oil boom completely collapses. Estimates for the clean-up of Alberta's oil sands tailings ponds and infrastructure are staggering. The official estimate is $57.3 billion as of June 30, 2024 (up from $47.31 billion in 2023 — a $10 billion increase in one year), according to the Alberta Energy Regulator. Only three per cent of this amount is currently covered by the Mine Financial Security Program (MFSP) meant to protect Albertans from footing the bill for mine clean-up costs that have doubled from an estimated $28 billion in 2018 Crude Oil Well Activity.
Narrative	Who we are as a province becomes cloudy if we proceed to invest in and count on a clearly declining commodity that is fast becoming the pariah of the world. Alberta has a choice and can recreate its narrative.

Appendix B: Industrial and Commercial Battery Storage Manufacturing in Alberta

Alberta presents a compelling opportunity for establishing Canada's first dedicated industrial and commercial battery energy storage system (ESS) manufacturing facility. As shown in recent project data, 12,600 MW of solar capacity, 9,100 MW of wind, and 5,556 MW of energy storage are either under construction, have received approval from the Alberta Utilities Commission (AUC), or have been announced by project proponents.[159]

[159] The Alberta Utilities Commission, https://www.auc.ab.ca/

The market opportunity is substantial, with E3 estimates showing that initial storage projects have a levelized fixed cost (LFC) of $190/kW-year and approximately $50/kW-year in tariff costs, indicating profitable economics for storage operators.

A Calgary-based facility focusing on containerized systems with a capacity of 500 kWh to 5 MWh could capture a significant market share by specializing in cold-climate optimization, with initial investment requirements of $500-750 million for an annual production capacity of 5 GWh. The facility would create 1,500-2,000 direct jobs and 4,000-6,000 indirect jobs.

Competition Analysis — Industrial/Commercial Storage

Global ESS Leaders

- **Tesla Energy:** Megapack systems (3 MWh units) manufactured in California
- **Fluence (Siemens/AES):** Market leader in utility-scale deployments
- **BYD:** Chinese manufacturer with growing North American presence

Canadian Market Position

- **No dedicated Canadian ESS manufacturers currently exist**
- Alberta has nearly 50 energy storage projects currently listed within AESO's projects list
- All systems are currently imported, creating a "Made in Canada" opportunity

Job Creation Prospects — Industrial/Commercial Focus

Total Direct Jobs: 1,500-2,000 positions

- **Engineering Roles:** Systems Engineers ($85,000-$120,000), Power Electronics Engineers ($90,000-$110,000)
- **Technical Positions:** Power Electronics Technicians ($70,000-$90,000), Testing Technicians ($65,000-$85,000)
- **Operations:** Assembly Operators ($55,000-$75,000), Warehouse/Logistics ($50,000-$65,000)

Indirect Employment: 4,000-6,000 across Alberta in supply chain, services, and research

Market Opportunities — Alberta Focus

Grid-Scale Storage Demand

- **Immediate Market:** Three standalone storage projects and four solar hybrid projects under construction will add approximately 170MW by 2026
- **Medium-term Growth:** AESO forecasts indicate 1,500-2,000 MW of storage needed by 2030

Industrial Applications

- Oil & Gas Sector: Remote facility power, pipeline compression stations, processing facility peak shaving
- Mining Operations: Off-grid power for northern Alberta/NWT sites, peak demand reduction
- Other Industrial: Data centers, cold storage facilities, manufacturing plants, agricultural operations

Appendix C: Alberta's Renewable Energy Export Market Potential

Alberta is well positioned to be a strong market leader in renewable energy exports. Strong financial mechanisms that make renewable energy exports a sound financial proposition need to be protected to ensure Albertans receive proper compensation for the production and export of energy from wind, solar and geothermal.[160]

Bottom Line: Alberta has the potential to become a significant renewable energy exporter, with the potential to export 25-40 TWh annually by 2050, generating $4-8 billion in revenue.

Major Export Markets Identified:

US Midwest (MISO Market) — The largest opportunity

- Covers 15 states with over 650 GW of capacity
- Import potential: 15-20 TWh annually
- Alberta already exports to this region during favourable price periods

California — Premium clean energy market

- 100 per cent clean energy mandate by 2045, with 60 per cent renewable by 2030
- Import potential: 8-12 TWh annually
- California needs to double its energy generation capacity by 2045

Pacific Northwest — Seasonal exchange partner

- BC already trades with Alberta, with flows reversing based on hydro conditions
- Exchange potential: 5-8 TWh annually

[160] Solar Alberta, pers comm.

Canadian Provinces — Interprovincial trade

- Current interties limited to 1 GW total (800 MW to BC, 200 MW to Saskatchewan)
- Trade potential: 3-5 TWh annually

Timeline for Export Development:

2025-2030: Foundation Phase

- Alberta is already at 18 per cent renewables and on track to exceed 30 per cent by 2030
- 2-5 TWh surplus emerging

2030-2035: Growth Phase

- Major transmission infrastructure development
- Need to expand interties from the current 1 GW to 5-8 GW capacity
- 8-15 TWh export capacity

2035-2050: Scale Phase

- Alberta projected to see 419,000 clean energy jobs by 2050
- 25-40 TWh annual export potential
- $4-8 billion annual revenue opportunity

Infrastructure Requirements

Alberta's current transmission interconnections are severely limited, with only 0.8 GW to BC and 0.2 GW to Saskatchewan. To capture export opportunities, Alberta will need:

- $8-12 billion investment in transmission infrastructure
- High-voltage DC transmission lines for long-distance exports
- Enhanced interconnections with all neighbouring jurisdictions

Research Notes

Chapter Two

LNG Demand Projections (60 per cent growth by 2040):

- Shell (2025). "Shell expects 60 per cent rise in global LNG demand by 2040" https://www.reuters.com/business/energy/shell-expects-60-rise-global-lng-demand-by-2040-2025-02-25/

LNG Supply Projections and Oversupply (666.5 MTPA by 2028):

- IEEFA (2024). "Global LNG Outlook 2024-2028" https://ieefa.org/resources/global-lng-outlook-2024-2028
- IEA (2025). "Global LNG Capacity Tracker" https://www.iea.org/data-and-statistics/data-tools/global-lng-capacity-tracker

Supply Glut Timeline (2027-2028):

- Bloomberg Professional Services (2024). "Global LNG Market Outlook 2030" https://www.bloomberg.com/professional/insights/markets/global-lng-market-outlook-2030-focus-on-supply-risks/
- IEEFA (2024). "Risks mount as World Energy Outlook confirms LNG supply glut looms" https://ieefa.org/resources/risks-mount-world-energy-outlook-confirms-lng-supply-glut-looms

Alberta Market Entry (2025):

- LNG Canada (2024). "About Us" https://www.lngcanada.ca/who-we-are/about-lng-canada/
- BOE Report (2025). "As LNG opens new markets for Canadian natural gas, reliance on U.S. to decline" https://boereport.com/2025/05/24/as-lng-opens-new-markets-for-canadian-natural-gas-reliance-on-u-s-to-decline-analyst/

Long-term Demand Projections (2035-2050):

- McKinsey (2021). "Global gas outlook to 2050" https://www.mckinsey.com/industries/oil-and-gas/our-insights/global-gas-outlook-to-2050

Renewable Energy Competition Timeline:

- IEA World Energy Outlook referenced in IEEFA analysis, indicating no new LNG capacity needed beyond 2040 under conservative scenarios

Chapter Six

Alberta as a Renewable Energy Hub:

- Alberta Electric System Operator data showing 12,600 MW of solar capacity, 9,100 MW of wind and 5,556 MW of energy storage in the development pipeline www-integ.aeso.ca/future-of-electricity/albertas-power-system-in-transition/
- Alberta is currently at 18 per cent renewables and on track to exceed 30 per cent by 2030, with potential to hit the target as early as 2024 www.misoenergy.org/markets-and-operations/markets-and-operations/
- In 2023, 92 per cent of Canada's growth in renewable electricity generation came from Alberta misoenergy.org/markets-and-operations/real-time--market-data/market-reports/

Export Capacity Projections (25-40 TWh):

- AESO's 2024 Long-Term Outlook forecasts a supply surplus into the 2030s because of recent gas-fired and renewable additions https://www.eia.gov/electricity/gridmonitor/dashboard/electric_overview/balancing_authority/MISO
- Research showing Alberta could hit 29.4 per cent renewable electricity generation by 2024, with capacity under construction forecast to push renewable share significantly higher https://www.misoenergy.org/markets-and-operations/markets-and-operations/

US Midwest (MISO) Market (15-20 TWh):

- MISO operates competitive wholesale electricity markets covering 15 U.S. states with thermal resources producing the bulk of electricity https://www.energy.gov/oe/learn-more-about-interconnections
- U.S. electricity imports from Canada are showing MISO net inflows from Manitoba Hydro and Ontario, demonstrating established import infrastructure U.S. electricity exports to Canada have increased since September 2023 — U.S. Energy Information Administration (EIA) https://www.eia.gov/todayinenergy/detail.php?id=63684

California Market (8-12 TWh):

- California's RPS requires 60 per cent renewable by 2030 and 100 per cent clean energy by 2045 https://www.utilitydive.com/news/california-sweeping-climate-package-carbon-neutrality-2045-clean-electricity-2035-diablo-canyon/631099/
- California may need to more than double its energy generation capacity by 2045 to meet the 100 per cent clean energy target https://www.energy.ca.gov/programs-and-topics/topics/renewable-energy/clean-energy-serving-california
- California is adding 7,000 MW of new clean energy capacity in 2024 alone, with more than 75,000 MW expected by 2040 https://www.irena.org/-/media/Files/

IRENA/Agency/Publication/2018/Apr/IRENA_Report_GET_2018.pdf

Pacific Northwest Markets (Washington/Oregon):

- Washington requires 100 per cent clean energy by 2045 and carbon-neutral by 2030 https://www.thisoldhouse.com/solar-alternative-energy/reviews/renewable-energy-by-state
- Oregon produces 12,734 thousand megawatt hours of renewable electricity, with the goal of 100 per cent greenhouse gas emissions reduction by 2040 https://www.integrityenergy.com/blog/the-top-10-states-paving-the-way-to-a-sustainable-energy-future/
- BC Hydro trading with Alberta, with flows reversing based on drought conditions and hydropower availability https://www.eia.gov/todayinenergy/detail.php?id=63684

Canadian Provincial Markets:

- Alberta only has very limited interties, with capacities of 0.8 GW with B.C. and 0.2 GW with Saskatchewan
- SaskPower is seeking to expand transmission capacity with the Southwest Power Pool to 650 MW by 2027

Regional Market Projections (Montana, Dakotas, Minnesota):

- State renewable energy targets: North Dakota at 36.4 per cent renewables, Minnesota with growing clean energy requirements https://www.thisoldhouse.com/solar-alternative-energy/reviews/renewable-energy-by-state
- 37 interconnection points between Canada and the US, allowing Canada to export around 10Per Cent of its electricity generation https://www.electricity.ca/knowledge-centre

Transmission Infrastructure Context:

- Alberta has interties with Saskatchewan and B.C. for stability, with the ability to import 0-780 MW from B.C. and export 0-800 MW
- Strong interconnections between Alberta's intermittent wind and solar with BC's and Manitoba's firm hydro could enable 100Per Cent renewable, steady supply export to US states https://energycentral.com/c/tr/case-stronger-grid-interconnections-increased-canadian-electricity-exports-while

Chapter Seven

Financial Framework and Implementation Timeline

Infrastructure Costs:

- TD Economics — Electrifying the Future: Solving the challenge of connecting new

solar and wind projects https://economics.td.com/ca-interconnection-challenges

- Canada's power grid needs $293B infusion: report https://www.cbc.ca/news/canada/canada-s-power-grid-needs-293b-infusion-report-1.1002711

Generation Technology Costs:

- Wind, solar set to be cheaper than gas in Ontario, Alberta: report • SustainableBiz Canada https://sustainablebiz.ca/wind-and-solar-set-to-be=cheaper-than-gas-in-ont-alta-report
- Cost of Renewable Generation in Canada — Clean Energy Canada https://cleanenergycanada.org/wp-content/uploads/2023/01/RenewableCostForecasts_CleanEnergyCanada_Dunsky_2023_SlideDeck.pdf

Battery Storage Economics

- Utility-Scale Battery Storage https://atb.nrel.gov/electricity/2024/utility-scale_battery_storage
- Why Alberta—and all of Canada—need energy storage https://renewablesassociation.ca/why-alberta-and-all-of-canada-need-energy-storage/

Economic Benefits:

- Powering the Clean Energy Transition: Net-Zero Electricity in Canada | IISD https://www.iisd.org/articles/deep-dive/powering-clean-energy-transition-canada
- How 100 per cent Renewable Energy by 2050 will cost Canadians less money — Citizens' Climate Lobby https://canada.citizensclimatelobby.org/how-100-renewable-energy-by-2050-will-cost-canadians-less-money/

Federal Investment Framework

- Powering Canada's Future: A Clean Electricity Strategy — Natural Resources Canada https://natural-resources.canada.ca/energy-sources/powering-canada-s-future-clean-electricity-strategy
- Alberta: Clean electricity snapshot — Canada.ca https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/clean-electricity/overview-alberta.html

Export Revenue Potential

- Energy Experts Applaud as B.C. Pushes to Restore Transmission Link with Alberta https://www.theenergymix.com/energy-experts-applaud-as-b-c-pushes-to-restore-transmission-link-with-alberta/

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End of Research Notes

Alberta Energy Transition Balance Sheet Example

Below is a back-of-the-envelope balance sheet for Alberta's energy transition. It is not presented to be definitive, but rather as an example of what the province and its stakeholders might consider when mapping out the next steps in Alberta's economic development.

All figures in CAD BILLIONS over 25 years:

		Estimated Expense Range, over 25 years (CAD Billions)		
Category	**Description**	**Low Range Estimate**	**Medium/ High Range Estimate**	**Source/Notes**
Likely Expenses/Investments Incurred		**In Billions CND**		
Renewable Energy Infrastructure	Solar, wind, battery storage, grid modernization	$285B	$345B	Moderate Scenario, New Frontiers
Energy Efficiency Programs	Building retrofits, industrial efficiency	$35B	$35B	Balanced Scenario, New Frontiers
Smart Grid Infrastructure	Grid modernization and integration	$12B	$30B	Electrification Scenarios
Workforce Transition	Retraining oil and gas workers	$15B	$15B	Comprehensive 25-year plan
Early Retirement Programs	Bridge pensions and benefits	$6B	$6B	35,000 workers, with an average salary of $180,000 per person.
Core FiveSector Development	Housing, manufac-turing, construction, healthcare	$50B	$75B	Strategic private investment with public support
Agricultural Transformation	Equipment electrifica-tion, processing, CEA	$47B	$47B	Agricultural modern-ization program
Indigenous Partnerships	Clean energy projects and capacity building	$1B	$2B	Phased Approach
Oil Sands Stranded Assets	Unrecoverable investment in a declining sector	$70B	$70B	CCPA report on the oil sands collapse scenario

Environmental Cleanup Costs	Oil & gas well remediation, tailings clean up	$120B	$300B	Polluter Pays Estimate
Legacy Infrastructure Maintenance	Maintaining minimal operations during transition	$20B	$30B	Strategic revenue and emergency capacity
Total Expenses	**All Categories Combined**	**$661B**	**$955B**	
Revenue Concurrent with Expenses / Investments		**In Billions CND**		**Who Benefits**
Renewable Energy Sales	Domestic electricity sales and exports	$150B	$200B	Business, Communities, Government, and individuals
Energy Efficiency Savings	Annualized savings from 25 per cent energy reduction	$175B	$280B	Business, Communities, Individuals
Carbon Credit Revenue	Agriculture and Renewable Energy Credits	$32B		Agriculture industry, communities
Core FiveGDP	Increased economic output from diversified sectors	$300B	$500B	Business, Communities, Government, and individuals
Agricultural Revenue Growth	Enhanced productivity, processing, and CEA	$350B	$550B	Agriculture industry, communities, government
Critical Minerals	Lithium, rare earth elements, and uranium	$400B	$650B	Industry, Business, Communities, Government
Technology & Innovation	Clean tech exports, intellectual property	$100B	$150B	Business, Communities, Government, and individuals
Heritage Fund Dividends	3 per cent levy on oil profits, strategic investments	$300B	400B	Communities, Government, and individuals
Federal Co-Investment	Federal climate and infrastructure funding	$100B	200B	Business, Communities, Government, and individuals
Health Cost Savings	Reduced air pollution, improved health outcomes	$50B	100B	Communities, Government, and individuals
		$1,957B	**$3,030B**	
Net Economic Benefit		**$1,296B**	**$2,075B**	
Return on Investment over 25 years		**2.9X**	**3.4X**	