Alberta emissions reduction and energy development plan

Alberta

Alberta emissions reduction and energy development plan | Environment and Protected Areas
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Message from the Honourable Danielle Smith
Premier of Alberta
Minister of Intergovernmental Relations

It is my pleasure to introduce the Alberta Emissions Reduction and Energy Development Plan, which charts Alberta's course for cutting emissions, attracting investment, working with Indigenous communities, and supporting well paid jobs without hurting or halting the economic activity our province is built on.

For decades, Alberta has paved the way on climate and emissions reduction policy, building a reputation for world-class technological expertise and being a responsible, reliable and secure energy producer. The Alberta Emissions Reduction and Energy Development Plan outlines and expands on this practical and proven approach, and is yet another step in Alberta's strong leadership to set policies and manage our provincial natural resources in a way that meets the unique needs of Albertans, our environment and our economy.

This is an Alberta-made plan built with our expertise, our unique emissions profile and our economic circumstances at its heart. Instead of moving away from hydrocarbons, we will use these resources in innovative ways to ensure Alberta continues to provide the world with sustainably-produced energy and products.

Our approach to reducing emissions is based on reality, instead of unachievable targets set to random timelines. Our plan applies a provincial and global lens, and recognizes the need to adapt and pivot – taking into account geopolitical instability, energy security and a global move towards a lower-emissions future. We know our plan will also need to rise to new opportunities, such as how Alberta can play a major role in lowering global emissions by replacing coal with liquefied natural gas now, and in the longer term by exporting hydrogen to world markets. The Alberta Emissions Reduction and Energy Development Plan also represents our continued work to support democracy and human rights by displacing oil and gas from Russia, Venezuela and other, less democratic jurisdictions with weaker environmental standards compared to Alberta.

Our plan underscores how Alberta can, and will, be a part of the solution to safeguard North American and global energy security.

Danielle Smith
Premier

Message from the Honourable Sonya Savage
Minister of Environment and Protected Areas

Alberta has paved the way on climate and emissions policy for more than two decades, and the Alberta Emissions Reduction and Energy Development Plan outlines and expands on this practical and proven approach. Our province introduced Canada's first climate plan in 1998, North America's first industrial carbon price and emissions trading system in 2007, and was the first regional government in North America to set a methane emissions reduction target in 2015. We are on track to meet and exceed this methane reduction target ahead of schedule. We are also on track to transition from coal-fired electricity in 2023, seven years ahead of provincial and federal targets. On top of these incredible achievements, Alberta's oil and gas industry has well-defined decarbonization plans, with targets backed by legitimate technology pathways. The Pathways Alliance, a partnership of the six largest oil sands companies representing 95 per cent of oil sands production, have joined together with a goal to achieve net zero emissions from their operations by 2050.

Alberta's aspiration of achieving a carbon neutral economy – net zero – by 2050 will take a dedicated and focused effort to achieve. This will require technologies that are not viable today to come to scale. It will require attracting billions of dollars of investment and providing a regulatory and investment climate that is predictable and certain. And, it will require working together with industry, Indigenous communities and organizations, the financial community, federal and municipal governments, and others to find viable pathways to reduce emissions in the most effective manner.

Whether it is Alberta, or anywhere else on the planet, the reality is that the global economy cannot reach net zero by 2050 without government policies that simultaneously balance energy security, reliability, affordability and decarbonization. That is why we need to continue to support and invest in today's energy system, which relies on oil and gas, while simultaneously preparing for the energy solutions of tomorrow. The Alberta Emissions Reduction and Energy Development Plan recognizes this and focuses on not only reducing emissions but also on supporting domestic energy production and removing barriers to an evolution in energy that is already underway.

We have already invested billions of dollars through the Technology Innovation and Emissions Reduction (TIER) fund to help industry cut emissions, and we are recognized as a leader in developing carbon capture, utilization and storage (CCUS). Large-scale support for CCUS is essential for meeting Canada's long-term climate goals and energy security. Our early leadership has resulted in timely emissions reductions and will continue to do so, guided by the Alberta Emissions Reduction and Energy Development Plan.

Alberta understands the importance of identifying achievable pathways to emissions reductions. We are completing comprehensive assessments of technology pathways with industry and experts in each sector, including technology requirements, costs, timeframes and policies and programs needed to accelerate emissions reductions. This is fundamental to setting technologically and economically achievable pathways to decarbonization.

Above all, Alberta has a rare opportunity in history to provide the foundation for decades of success, built upon the cornerstone of our energy sector – innovation, entrepreneurship, and ingenuity. We have the potential to expand into new and emerging forms of energy. And we have the potential to be the supplier of choice in a world that is looking for low emission energy.

I look forward to seeing Alberta's realistic and deliberate Emissions Reduction and Energy Development Plan in action, to the benefit of our environment, our economy, and all Albertans – today and into the future.

Sonya Savage

Minister of Environment and Protected Areas

PART ONE

Part 1: Introduction

Alberta's plan will cut emissions, not economic growth.

Alberta is committed to finding viable policies, pathways and programs to lower emissions. We aspire to achieve a net zero carbon neutral economy by 2050, and to do so without compromising affordable, reliable and secure energy for Albertans, Canadians and the world.

This will require working with our industries to build achievable pathways to reduce emissions across all sectors. This will require new technologies that are not currently scalable or even viable. Our approach is to attract investment by creating a regulatory and investment climate that is predictable, agile and certain. It will require building partnerships with Indigenous Peoples as a key aspect of reconciliation, and it will necessitate Indigenous leadership in natural resource and energy development.

For Alberta, emissions reduction policy is more than environmental policy. It is strategic economic, energy, social, and industrial development policy. It is designed to provide the stability and predictability that industry and investors are looking for to ensure investment and economic growth.

Global energy demand is expected to grow over the coming decades with a significant shift to lower-emitting energy production. Alberta can and should play a major role in meeting that demand. That includes lowering emissions in oil and gas production to remain competitive in a global market. This includes supplying liquefied natural gas (LNG) to lower global emissions by replacing coal and in the longer-term exporting hydrogen to world markets.

The energy transformation underway is one of the greatest generational opportunities to diversify and grow Alberta's economy. Unlocking billions of dollars of private and institutional capital will enable a range of sectors to expand current technologies and develop transformative new ones. Alberta can take advantage of our early first mover status on carbon capture, utilization and storage (CCUS), hydrogen, methane reduction, emissions intensity reductions in the oil and gas sector, innovation and technology and our established carbon pricing and emissions trading system, known as the Technology Innovation and Emissions Reduction (TIER) system.

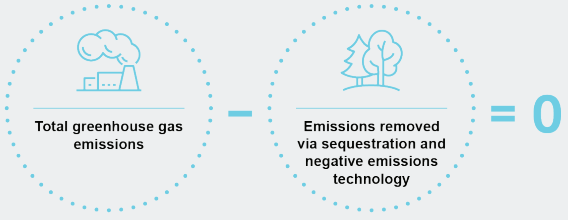
As a global energy supplier with approximately one quarter of provincial gross domestic product from emissions-intensive and trade-exposed sectors, the province has a lot at stake. Alberta, not Ottawa, is best positioned to design and implement policies to reduce emissions within our borders. Alberta has exclusive constitutional jurisdiction over exploration, development, conservation and management of non-renewable resources and electricity generation.

Albertans have always controlled their own destinies, from our entrepreneurial roots in farming and ranching to the ingenuity of small businesses across this province. We want to decide our future, our way. By designing and implementing practical and achievable policies with environmental objectives, we will reduce emissions across all sectors, creating a pathway to carbon neutrality.

Albertans expect action, and our aspiration is to achieve a carbon neutral economy by 2050.

Carbon neutrality (often referred to as net zero) means that any greenhouse gas (GHG) emissions released into the atmosphere will be balanced through removals such as nature-based or technological sequestration, or offset with GHG emissions reduction or removal credits including the international transfer of carbon credits between countries under Article 6 of the Paris Agreement. Alberta's pathway to carbon neutrality by 2050 will leverage our existing infrastructure, expertise, ingenuity and ability to support emissions reductions beyond our borders. It will be done at a pace that ensures affordability, reliability and safety for Albertans and Canadians.

Net zero means that any emissions are offset by GHG removals



PART TWO

Part 2: Vision, strategic directions and principles

Alberta is an energy producing province. Our vision is to be a global leader in emissions reductions, innovation and technology, and sustainable development of our resources.

Our goal is to reduce emissions while responsibly supplying energy to the world. Alberta can and will continue to reduce domestic and global emissions while attracting investment in oil and gas, oil sands, hydrogen,[1] electricity generation, renewables, chemicals, fertilizer, transportation, manufacturing, critical minerals, construction, agriculture, forestry and all sectors of the economy.

This is a generational opportunity for Alberta. It is the beginning of an evolution that will be led by Albertans. Provided emissions reductions policies are done right, we can reduce emissions domestically and globally and attract investments to diversify the economy and create jobs an d prosperity across the province. Through our ingenuity, our industry leadership and our "get it done" attitude that is the hallmark of our culture, Alberta can and will provide low-emissions energy to the world.

The following strategic directions and principles are foundational to Alberta's approach to drive emissions reductions while growing our economy.

An Alberta plan based on practical, achievable pathways.
Most emissions in Alberta are from industrial sectors, requiring an approach that is different from other jurisdictions in Canada. The key to reaching Alberta's aspiration of carbon neutrality by 2050 will be based on innovation and technology developed and deployed in industrial sectors.[2] Alberta is engaged in a systems-based approach to identify achievable pathways to reduce emissions; opportunities to reduce emissions by sector; the associated costs and technology; timelines required; and the programs and policies needed to further accelerate reductions.[3]

Delivering Alberta energy to the world while reducing emissions.
Emissions reduction policies and targets must be viewed with both a domestic and global lens. As a significant producer of natural gas, Canada is uniquely positioned to help improve world energy security and lower global emissions by shipping our LNG abroad, displacing higher emitting fuels like coal for generating electricity. Through alignment of our industrial credit standards and policy, Alberta may be able to support other jurisdictions such as British Columbia to achieve its goal of cleanest LNG worldwide through our CCUS expertise and more suitable geology for long-term carbon storage.[4] Alberta can lower emissions domestically and globally.

Affordability and reliability.
Alberta's approach recognizes that Albertans are struggling today with the rising cost of living due to inflation. As well, our approach recognizes that all Canadians depend on a reliable supply of electricity and heat to live comfortably and safely in Canada's sometimes harsh climate. Therefore, each action and approach within the plan must be practical and not compromise the affordability and reliability of Alberta energy.[5]

Energy security.
Climate policies must also consider energy security, geopolitical insecurity, and a global move to a low-emissions future. Alberta energy resources can and should displace energy from less democratic global energy producers.[6]

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[1] Alberta's resources enable large-scale production of low-cost and low-carbon intensity hydrogen — also known as clean hydrogen — that is highly competitive in the rapidly growing global hydrogen market.

[2] For more context, see Part 3, Industrial carbon pricing and emissions trading system - TIER, p. 14, and Clean technology and innovation, p. 17.

[3] For more context on unique emissions profile and approach to finding achievable pathways to emissions reductions, refer to Part 4, p. 21.

[4] For more context, see Part 3, Carbon capture, utilization and storage, p. 18.

[5] For more context on affordability and reliability, refer to Part 4, p. 21 and Part 5, p. 32.

[6] For more context on energy security, refer to Part 5, Oil and Gas, p. 25.

Partnership with Indigenous communities and organizations.
Alberta seeks to partner with Indigenous Peoples as stewards of the land, water and air. Traditional ecological knowledge is valued and already considered in development decisions. As we move forward, we will encourage joint participation in emissions reduction plans as well as resource development. By designing competitive processes that respond to Indigenous issues and include Indigenous perspectives, Alberta strives to maximize economic and social development in Indigenous communities. The *Alberta Indigenous Opportunities Corporation Act*, through one billion dollars in loan guarantees, helps Indigenous communities to invest in natural resource, agriculture, telecommunications and transportation projects.[7]

Industrial policy and systems approach.
The technological innovation needed will require all levels of government to be responsive to industry and investor requirements, especially for de-risking and policy certainty. This will require collaboration between the province, industry and Indigenous communities and organizations, labour, finance and others. It will need a supporting policy framework from the federal government that encourages investment and enables Canada and Alberta to compete with programs like the *Inflation Reduction Act* in the United States, which offers companies over $350 billion in subsidies and tax credits to clean technology companies that shift their operations to the United States.[8]

Sustainable finance.
Decarbonization will require continued large-scale financing. The financial sector's commitments to net zero and related investments to support this goal are expected to grow significantly every year. Alberta will work to ensure that policy and funding support are in place to attract investment into the province. As the national framework for sustainable finance is developed, it is critical that natural gas is considered a transition fuel and that traditional energy sectors are able to access transitional finance.[9]

> "Indigenous leadership is increasingly becoming an integral part to addressing climate change and energy development. By capitalizing communities to participate in GHG reduction initiatives, empowering our workforce and having a seat at the table in environmental and regulatory processes and frameworks we can help lead the change necessary for our country and future generations."
>
> - JP Gladu, Principal of Mokwateh, Past President and CEO of the Canadian Council for Aboriginal Business

Conservation protection and enhancing our nature-based solutions.
Alberta's world-class environmental management systems ensure our natural resources and human and ecosystem health are protected. Alberta has modernized its Crown land management framework and is committed to continuing to work with private landowners, Indigenous communities and others regarding integrated land-use planning, protection and conservation. This supports nature and climate policy objectives among many other environmental and socio-economic considerations.[10]

These are the principles of a made-in-Alberta Emissions Reduction and Energy Development Plan – a bold and unmistakably Albertan plan to lower emissions to carbon neutral by 2050, with practical, feasible actions that harness the ingenuity, the passion and the creativity of our province.

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[7] For more context on Indigenous partnerships, refer to Part 3, Indigenous leadership, p. 12.

[8] For more context on policy support for attracting investment, refer to Part 4, p. 21.

[9] For more context, for more context, see p. 57.

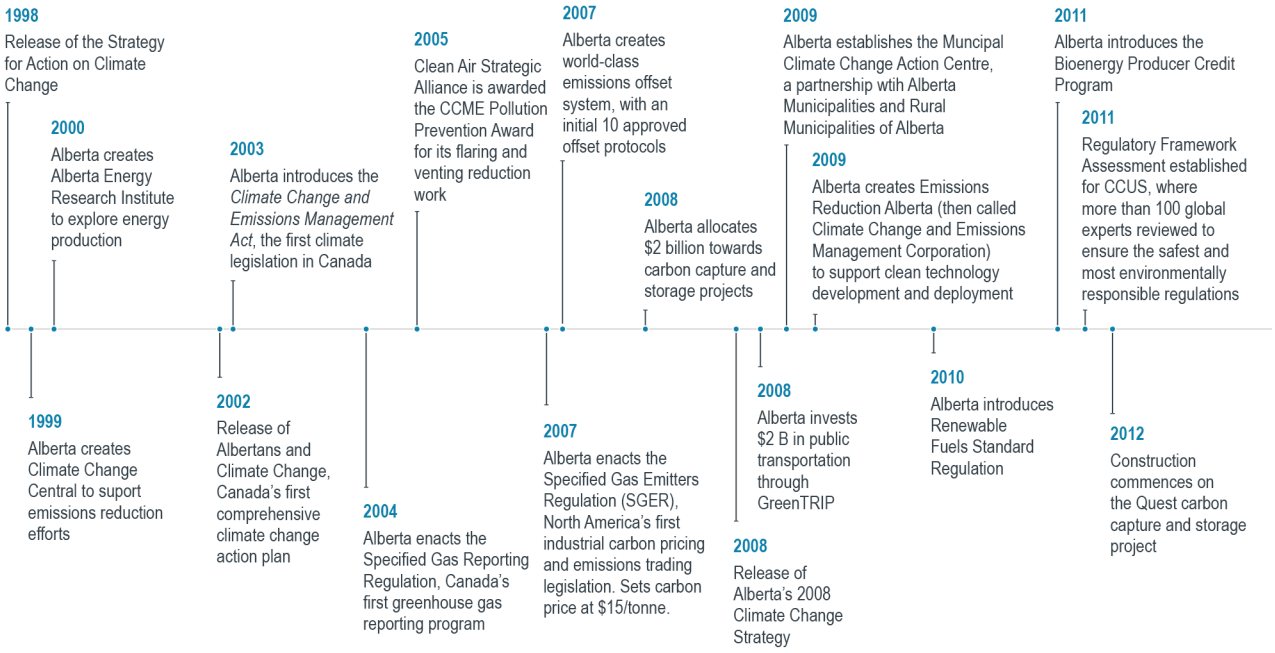
[10] For more context, see Part 5, Land and nature-based solutions, p. 55 and Part 6, Conservation, restoration and land management, p. 63.

PART THREE

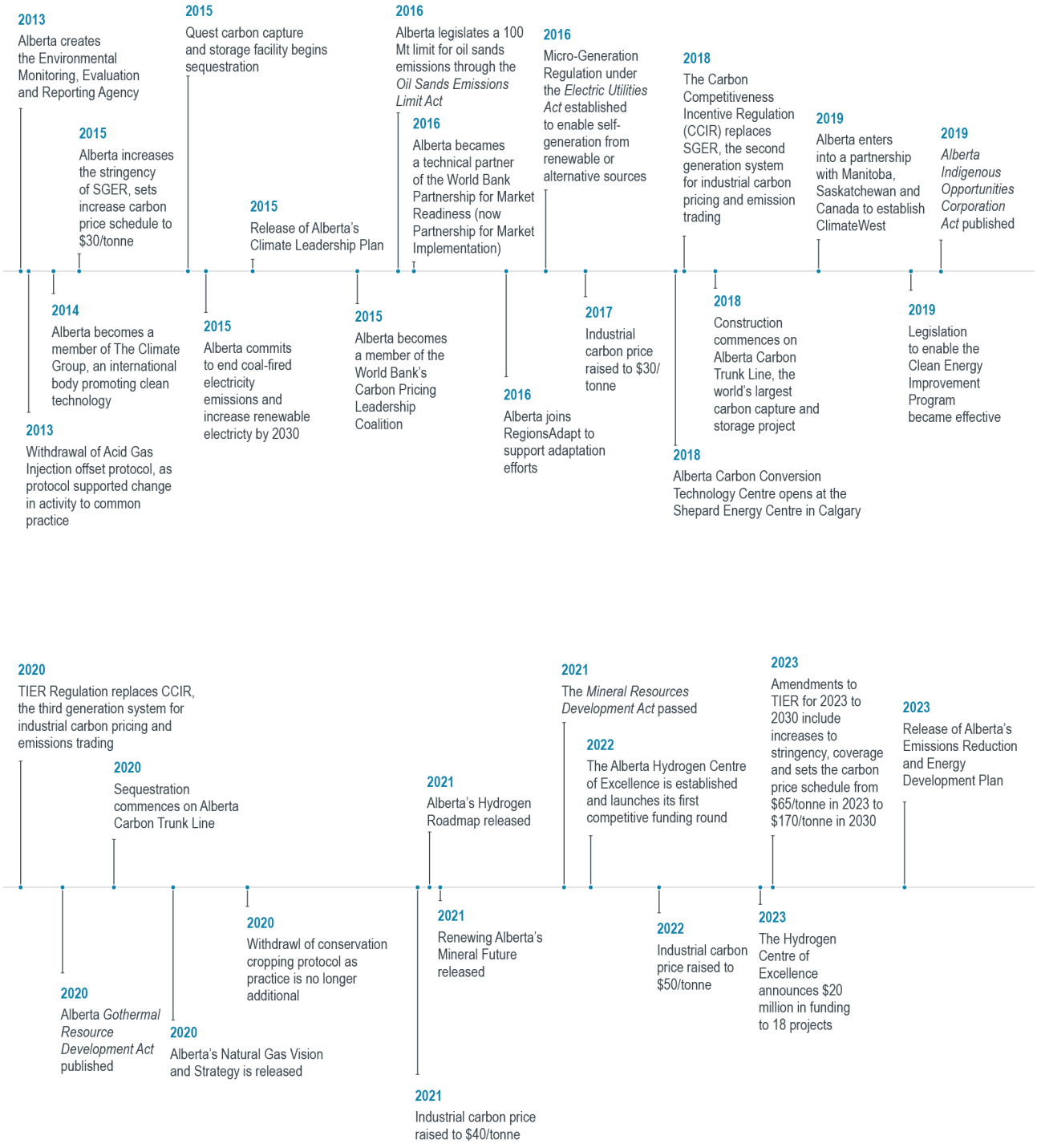
Part 3: Alberta's ongoing legacy of emissions reduction policy leadership

Alberta is a global leader in emissions reduction and climate policy. Alberta's environmental leadership is unparalleled, from introducing the first climate strategy in Canada, the first North American price on industrial emissions, to an internationally recognized methane emissions reduction framework, and setting an example for the world by investing in innovative technologies like carbon capture, utilization and storage.

In 2007, Alberta put a price on carbon for large industrial emitters. As of December 2021, Alberta's industrial carbon pricing framework has resulted in almost 215 million tonnes (Mt) of required emissions reductions. This has been achieved through reductions at regulated facilities and reductions from projects that are not subject to the industrial carbon pricing system. It also has been achieved through payments to the Technology Innovation and Emissions Reduction (TIER) fund, which then invests in projects and technologies that reduce emissions.



PART THREE


2013
Alberta creates the Environmental Monitoring, Evaluation and Reporting Agency
2013
Withdrawal of Acid Gas Injection offset protocol, as protocol supported change in activity to common practice
2014
Alberta becomes a member of The Climate Group, an international body promoting clean technology
2015
Alberta increases the stringency of SGER, sets increase carbon price schedule to $30/tonne
2015
Quest carbon capture and storage facility begins sequestration
2015
Alberta commits to end coal-fired electricity emissions and increase renewable electricty by 2030
2015
Release of Alberta's Climate Leadership Plan
2015
Alberta becomes a member of the World Bank's Carbon Pricing Leadership Coalition
2016
Alberta legislates a 100 Mt limit for oil sands emissions through the Oil Sands Emissions Limit Act
2016
Alberta becames a technical partner of the World Bank Partnership for Market Readiness (now Partnership for Market Implementation)
2016
Alberta joins RegionsAdapt to support adaptation efforts
2016
Micro-Generation Regulation under the Electric Utilities Act established to enable self-generation from renewable or alternative sources
2017
Industrial carbon price raised to $30/tonne
2018
Alberta Carbon Conversion Technology Centre opens at the Shepard Energy Centre in Calgary
2018
The Carbon Competitiveness Incentive Regulation (CCIR) replaces SGER, the second generation system for industrial carbon pricing and emission trading
2018
Construction commences on Alberta Carbon Trunk Line, the world's largest carbon capture and storage project
2019
Alberta enters into a partnership with Manitoba, Saskatchewan and Canada to establish ClimateWest
2019
Alberta Indigenous Opportunities Corporation Act published
2019
Legislation to enable the Clean Energy Improvement Program became effective
2020
TIER Regulation replaces CCIR, the third generation system for industrial carbon pricing and emissions trading
2020
Alberta Gothermal Resource Development Act published
2020
Sequestration commences on Alberta Carbon Trunk Line
2020
Alberta's Natural Gas Vision and Strategy is released
2020
Withdrawl of conservation cropping protocol as practice is no longer additional
2021
Alberta's Hydrogen Roadmap released
2021
Renewing Alberta's Mineral Future released
2021
Industrial carbon price raised to $40/tonne
2021
The Mineral Resources Development Act passed
2022
The Alberta Hydrogen Centre of Excellence is established and launches its first competitive funding round
2022
Industrial carbon price raised to $50/tonne
2023
Amendments to TIER for 2023 to 2030 include increases to stringency, coverage and sets the carbon price schedule from $65/tonne in 2023 to $170/tonne in 2030
2023
The Hydrogen Centre of Excellence announces $20 million in funding to 18 projects
2023
Release of Alberta's Emissions Reduction and Energy Development Plan

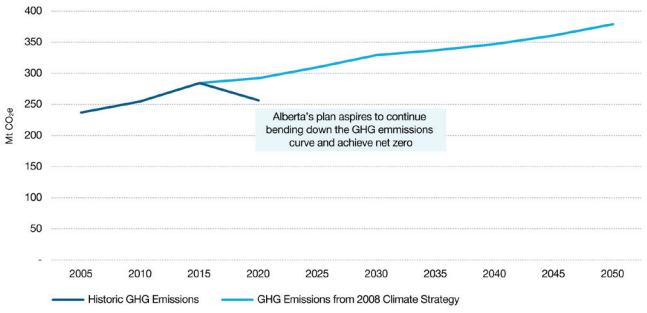
Alberta's emissions are going down

Alberta is leading emissions reduction among many jurisdictions in Canada today. The province and industry have led through early investment and leadership in CCUS, methane emissions reductions, elimination of coal-fired electricity generation in 2023, a comprehensive plan for the oil sands to reach net zero emissions from operations through the Pathways Initiative, a hydrogen roadmap, leadership in a circular economy, bitumen beyond combustion and more.

Today Alberta's annual emissions are down from 281 Mt in 2015 to 256 Mt in 2021. Alberta has lowered emissions and reduced projected growth in emissions significantly, decoupling our emissions growth from economic growth.

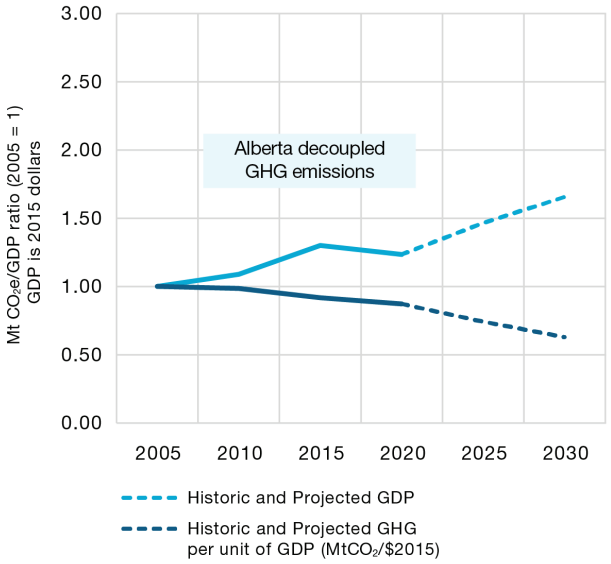
Alberta's success in achieving meaningful emissions reductions has been enabled by working with Indigenous organizations and communities, through leadership and early action in industrial carbon pricing, clean technology and innovation, and CCUS. These are cross-cutting approaches to emissions reductions in all sectors of our economy and are fundamental to Alberta achieving emissions reductions in the past and in the future.

Alberta's total historic and forecasted GHG emissions



Data from ECCC (2023) National Inventory Report

Alberta's historic and projected GHGs per unit of GDP



Data from ECCC (2023) National Inventory Report and Statistics Canada, Table: 36-10-0222-01

Indigenous leadership

Indigenous engagement and participation are foundational to past success in reducing emissions, and they will be crucial to delivering on the Emissions Reduction and Energy Development Plan in the future. Indigenous communities will be at the forefront of lowering emissions, responsible energy development and protection of wildlife, forests, land and water. The pathway to reducing emissions and energy development must include a transparent and trusted partnership with Indigenous partners to enable economic benefits to flow to communities. Alberta is building partnerships with Indigenous communities as a key aspect of the province's process of reconciliation.

Traditional ecological knowledge is considered in development decisions. By designing competitive processes that respond to Indigenous issues and including Indigenous perspectives, Alberta strives to maximize economic and social development in Indigenous communities.

In 2019, the Alberta government created the Alberta Indigenous Opportunities Corporation (AIOC), the very first government guaranteed investment entity created in Canada. The *Alberta Indigenous Opportunities Corporation Act* formalized a loan guarantee of a billion dollars to facilitate investments in natural resource, agriculture, telecommunications and transportation for Indigenous Peoples in Alberta.

Over the past three years the AIOC has fostered vital partnerships with a variety of Indigenous groups, thus bridging the gap between Indigenous interests and commercial partnerships in major projects across Alberta.

"Responsible resource development benefits Indigenous Peoples. The energy sector has employed more First Nations in Canada than any other sector."

- Stephen Buffalo, President and CEO, Indian Resource Council of Canada

"Data from Census 2021 show that the extractive resource sectors, and the oil and gas sector specifically, provide the highest paying average wages for Indigenous workers in Canada.

- Indigenous people in Canada make almost three times more working in the oil and gas extraction sector than the average Indigenous worker ($140,400 vs $51,120 average employment income) and almost twice as much working in mining ($93,600).
- Indigenous women in particular benefit economically from working in the sector. The top three highest paying sectors for Indigenous women are oil and gas related."

Resource Sector Provides Highest Paying Jobs for Indigenous Workers in Canada (newswire.ca)

- Indigenous Resource Network, February 27, 2023

Highlights of AIOC investments:

- Since 2019, the AIOC has backstopped $410 million to support Indigenous investment, supporting 28 communities across the province.
- The AIOC's first loan guarantee was to a group of six First Nations, supporting their investment in the Cascade Power Project that, when completed, will supply eight per cent of Alberta's energy.
- Frog Lake First Nation received a $27-million loan guarantee to maintain ownership of their steam-assisted gravity drainage operation.
- A $40-million loan guarantee will also support eight Indigenous communities in the Wood Buffalo Region, to finance a 14.25 per cent ownership interest in the Northern Courier Pipeline System.
- A $250-million loan guarantee to support 23 Indigenous communities to buy into seven Enbridge-owned pipelines within the Athabasca oil sands system in northern Alberta.

Alberta is committed to engaging and exploring partnerships with Indigenous organizations and communities regarding implementation of this plan, including establishing an Indigenous Knowledge Keepers Committee to provide strategic advice as we move forward.

Alberta remains committed to supporting the exercise of Treaty rights by First Nations.

We will also evaluate increased supports for Indigenous participation and investment in clean technology and energy projects.

Industrial carbon pricing and emissions trading system – TIER

The Technology Innovation and Emissions Reduction (TIER) regulatory system is Alberta's third-generation industrial carbon pricing and emissions trading system. Alberta's leadership on industrial carbon pricing has been recognized nationally and globally as a practical and innovative way to reduce emissions while launching new projects and employment.

Alberta was the first jurisdiction in North America to put a carbon price on industrial emissions in 2007. Over 60 per cent of Alberta's emissions have a reduction requirement through the TIER Regulation.

The TIER Regulation requires any facility that emits 100,000 tonnes or more of carbon dioxide equivalent (CO_2e) annually to meet annual emissions reductions using either a facility-specific or a sector benchmark approach. Smaller facilities can voluntarily opt-in to TIER. Sectors subject to TIER include oil and gas, oil sands mining, electricity, forestry, chemicals (including hydrogen production), fertilizers, minerals, food processing and waste.

Regulated facilities can make investments to reduce emissions on site or can comply using credits (carbon offsets, emission performance credits or sequestration tonnes) or pay into the TIER fund at the established carbon price. Alberta's current carbon price is $65 per tonne (as of January 1, 2023), and it will rise by $15 annually until it reaches $170 per tonne in 2030.

TIER funds are invested into technology and innovation programs and projects to drive emissions reductions and increase Alberta's resilience to a changing climate.

Impacts of Alberta's industrial carbon pricing and emissions trading system:

- As of January 2021, Alberta's industrial carbon pricing framework has resulted in reduction requirements of almost 215 Mt since the framework came into effect in 2007.
- From 2009 to 2021, $2.5 billion from industrial carbon pricing funds was invested in programs that support emissions reductions and climate resiliency.
- Amendments to the TIER Regulation were made for January 2023 forward, providing ongoing and longer-term certainty to industry, continuing to protect competitiveness, and making continuous improvements to drive emissions reductions in Alberta.
- Amendments to TIER for 2023 forward include measures to drive methane emissions reductions through increased coverage as well as support for CCUS adoption through new classes of credits – sequestration and capture recognition tonnes.

Through Budget 2023, Alberta is investing $800 million in TIER funding across multiple sectors over the next three years (2023-24 to 2025-26) in projects and programs that will support jobs, reduce emissions and help Albertans adapt to climate change. This funding includes continued investments in programs delivered by partners, including Emissions Reduction Alberta, Alberta Innovates and the Municipal Climate Change Action Centre.

As part of continuous improvement, the TIER Regulation will be reviewed by the end of 2026 to ensure the policy is delivering the intended outcomes of emissions reductions while protecting competitiveness.

Incenting reductions across all sectors through Alberta's emission offsets

Emission offsets, also known as carbon offsets or carbon credits, are verified emissions reductions from designated activities that can be used to offset emissions in other areas of the economy. Facilities regulated by TIER can buy emission offsets to achieve emissions reductions required by the TIER Regulation. This enables regulated facilities to invest in lower cost emissions reductions while planning the necessary capital investment required to reduce on-site emissions. The Alberta Emission Offset System incents emissions reductions in industries and sectors not regulated by TIER.

Alberta's emission offset system is internationally recognized and is the longest-standing system in North America, established in 2007. This groundbreaking offset program has attracted interest from jurisdictions around the world, including in the United States, Australia and South Korea.

Alberta is also recognized for the large number of its established protocols or activities that can generate an offset.

Alberta's carbon offset protocols

Biological methane

- Aerobic composting
- Age/feeding beef cattle
- Beef cattle low residual feed intake
- Aerobic landfill bioreactor
- Landfill gas capture and combustion
- Biogas production and combustion
- Anaerobic wastewater treatment
- Dairy cattle
- Composting
- Anaerobic decomposition of agricultural materials
- Swine manure

Renewables

- Biofuel production and usage
- Distributed renewable energy generation
- Biomass waste energy
- Solar electricity generation
- Wind electricity generation
- Run-of-river hydro
- Changes in forest harvesting practices

Agricultural

- Agricultural nitrous oxide reductions (NERP)
- Conservation cropping

Energy efficiency

- Energy efficiency projects
- Waste heat recovery

CO_2 sequestration

- CO_2 capture and storage in deep saline aquifiers
- Enhanced oil recovery
- Acid gas injection

Transport

- Road rehabilitation
- Modal freight shift
- Bitumen binder in asphalt

Oil and gas methane

- Pneumatic devices
- Vent gas reductiuon
- Solution gas conservation
- Engine fuel management and vent gas capture
- Conversion of drilling rigs to electric

Protocols in blue text are also eligible for use under the federal output-based pricing system. Protocols in grey text are withdrawn.

Impacts of Alberta's carbon market:

- Currently, there are 18 approved protocols that can be used to quantify emissions reductions and generate emission offsets.
- Over 350 registered offset projects covering industrial, commercial, renewable energy, agricultural, forestry and waste sectors have resulted in 80.5 Mt of emissions reduction in Alberta between 2002 and 2023.
- Alberta's agriculture no-tillage and conservation cropping protocol resulted in over 17 Mt of emissions reductions from 2002 to 2021. The protocol provided incentive for farmers to invest in no-till farming practices in Alberta, which results in sequestration of carbon in soil.
- Alberta's emission offsets are approved by the Government of Canada for use in its output-based pricing system. Eligible protocols include those reducing emissions from aerobic composting, aerobic landfill bioreactors, pneumatic devices, fed cattle, and low residual feed intake markers in beef cattle.

As a leader in the design, development, acceptance and uptake of protocols, Alberta is uniquely positioned to provide expertise to other provinces and jurisdictions. Alberta will continue to share its expertise in emissions trading and carbon offsets with other provinces and jurisdictions to support national and global emissions reductions.

We will investigate a framework for a voluntary credit market in Alberta for activities or sectors, including objectives that support Article 6 of the Paris Agreement and the Carbon Offsetting and Reduction Scheme for International Aviation.

We will explore partnerships in emissions trading and market linkages with other provinces and jurisdictions, such as British Columbia, to support CCUS and clean LNG.

Clean technology and innovation

The Government of Alberta, together with Alberta Innovates, Emissions Reduction Alberta, the Alberta Enterprise Corporation, academia, industry and others, is working to develop and commercialize clean technology.

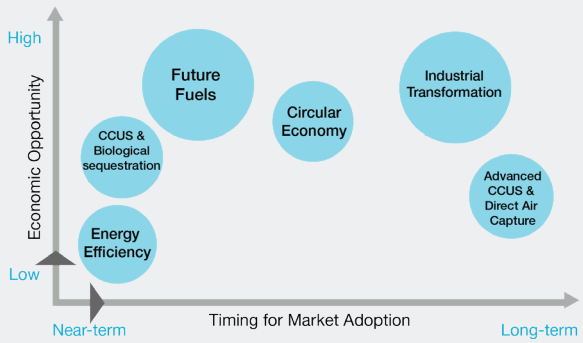
Together, we are focusing on overcoming barriers and advancing technology through all phases of development, from early-stage research to turnkey-ready systems. Early stage innovation risks may be high, but the rewards can be transformational. Turnkey reduction technologies may still need support for implementation and broad deployment.

Alberta is completing comprehensive assessments of technology pathways and barriers with industry and experts for each sector.

Over the next four years the government is investing $225 million in Emissions Reduction Alberta to continue supporting the development of clean technology adoption.

Emissions Reduction Alberta's Technology Roadmap articulates the pathways that will enable Alberta to have a competitive economy that delivers sustainable environmental outcomes, attracts investment, and contributes to a prosperous, lower-carbon world. The roadmap outlines the strategic direction for investments and ensures the advancement of the right mix of short, medium and long-term technologies.

Clean technology opportunities



Adapted from Emissions Reduction Alberta (2022), Technology Roadmap – fourth edition

Clean technology and innovation in Alberta:

- Canada's oil and gas industry, led by Alberta, is the largest contributor to clean tech spending in Canada.
- Since 2009, Emissions Reduction Alberta has invested approximately $885 million into 245 industrial and 1,812 commercial scale projects, with a total project value of $7.1 billion. These projects will support 33,400 person-year jobs by 2025, and support 41 Mt of emission reductions by 2030 and 105 Mt by 2050.
  - For every dollar Emissions Reduction Alberta invests, another seven dollars are also invested by industry, innovators, and other project funders. This will represent a GDP impact of $4.9 billion to Alberta by 2025.
  - Emissions Reduction Alberta has run a number of industry challenges such as Methane, Oil Sands Innovation, Industrial Efficiency, Natural Gas, Food, Farming and Forestry, Accelerating CCS technologies, and more.
- Alberta Innovates is the province's largest research and innovation agency. Alberta Innovates provides Alberta's innovation ecosystem with services from funding to commercialization, working to create new opportunities for a prosperous future for Albertans. The agency's Clean Resources area develops and invests in applied research and innovation programs to sustain, grow and diversify the energy and resource industries, develop clean and low-carbon technology, reduce GHGs, and protect Alberta's environment.
  - For every dollar invested by Alberta Innovates, there are at least another three dollars of external investment. Its investment portfolio focuses on projects with lower technology readiness levels (TRL 3 to 6), where investments are critical for long-term breakthrough innovations.

Carbon capture, utilization and storage

Alberta is a global leader in the design, construction and operation of carbon capture, utilization and storage (CCUS). Our province has a legacy of investment and innovation in CCUS from the original Alberta Carbon Trunk Line to the Quest project. We are taking action to enable some of the largest investment in CCUS in the world.

CCUS reduces emissions and creates economic opportunity. Based on currently available technology, up to 90 per cent of the carbon dioxide (CO_2) emissions produced from the use of fossil fuels in industrial activities can be captured, stored and/or used, depending on facility and technology deployment.[11]

Carbon utilization is the term used to describe the direct use of CO_2 (or conversion of carbon input) streams into valuable products. Alberta is already a leader in direct commercial use of carbon dioxide through enhanced oil recovery (EOR) to lower its carbon intensity and environmental footprint. Alberta is also home to demonstration projects for the use of carbon nanotubes.

Calgary-based micro-CO_2 capture and utilization company **CleanO_2 is producing the world's first carbon capture soap**. The first company of its kind is converting CO_2 from commercial buildings into pearl ash, commonly used in soaps and detergents. CleanO_2 won the 2019 JWN Energy Excellence Award and 2019 Nature Inspiration Award from the Canadian Museum of Nature.

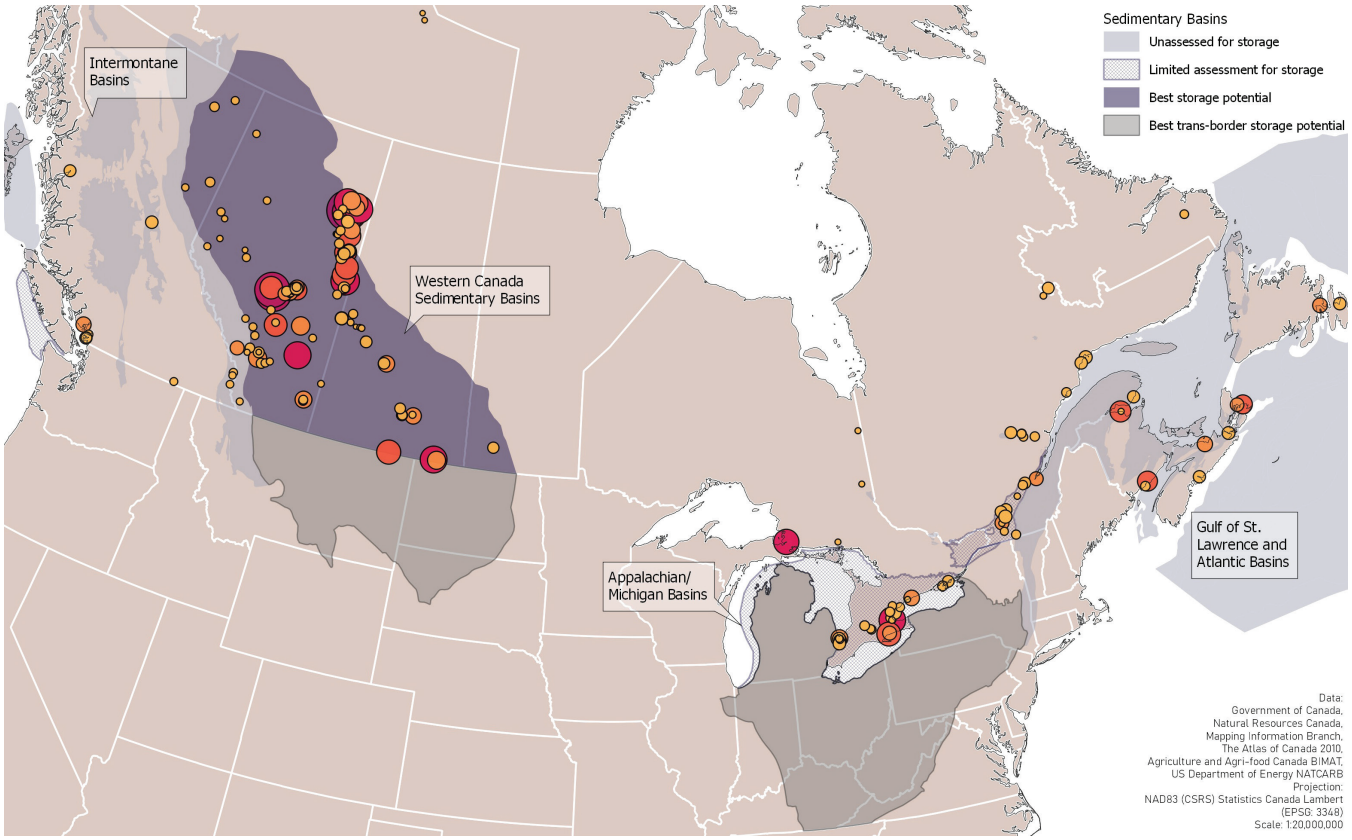
Alberta is uniquely suited for CCUS. We have an established regulatory process and are one of only a few jurisdictions that have the geology to store enough CO_2 to reach carbon neutrality by 2050. A long and growing list of CCUS projects has been proposed in Alberta. Proposals for 25 CCUS hubs approved in 2022 are moving to the evaluation stage. These hubs could facilitate decarbonization plans for the oil sands and for industries that include power, clean hydrogen, petrochemicals, upgrading and refining, cement, steel, fertilizer, biodiesel production and gas processing. These projects, worth billions of dollars, will position Alberta to reduce emissions domestically while allowing Alberta's products to compete strongly in a global market.

Alberta Innovates and Emissions Reduction Alberta have jointly supported the scale-up of Carbon Corp (formerly C2CNT). Carbon Corp uses 3.7 tonnes CO_2 and 7 megawatt hours of electricity to produce a tonne of **carbon nanotubes**. They have excellent thermal and electrical conductivity as well as enormous potential for battery energy storage and can be used as composites in a variety of materials to increase strength and reduce overall material requirements. Carbon nanotubes have significant potential applications to enhance the properties of everyday materials, including medicine, cement, steel, aluminum and electronics.

Capital Power intends to build the world's first commercial-scale carbon nanotube production facility at its Genesee Generating Station. With funding from the Government of Alberta provided to Alberta Innovates and Emissions Reduction Alberta, the technology developed by Carbon Corp is proving successful in tests at the Shepard Energy Centre in Calgary.

[11] The International Energy Agency has stated that, "initial results based on chemical absorption systems are promising, showing that CO_2 capture rates as high as 99% can be achieved at comparably low additional marginal cost relative to the cost of deploying 90% capture."

Carbon capture and storage potential



Source: The International CCS Knowledge Center, Canada's CO_2 Landscape; A Guided Map For Sources and Sinks 2021. Used with permission.

The Pathways Alliance, a partnership of the six largest oil sands companies, is combining best-in-class resources and execution to deliver the largest single CCUS project in North America. For a CCUS project of this scale and other emissions reductions technologies to be in place by the end of the decade, more than $24 billion will need to be invested. This investment is expected to generate 35,000 construction-related jobs, 1,000 new permanent positions, protect more than 25,000 existing jobs, and unlock more than $50 billion in GDP. (The Canadian automotive industry, for comparison, generates more than $19 billion in GDP annually.) This single project, when completed, will sequester almost 1.7 per cent of Canada's total emissions.

The First Nation Capital Investment Partnership (FNCIP) comprises the First Nations of Enoch Cree, Paul, Alexander and Alexis Nakota Sioux. FNCIP is involved in the Open Access Wabamun Carbon Hub west of Edmonton and the Wolf Midstream project east of Edmonton. FNCIP and Lac St. Anne Métis have 50 per cent ownership in the Wabamun project. FNCIP has 30 per cent ownership in the Wolf Midstream project, which also involves Heart Lake First Nation.

Blindman Brewing, in partnership with Earthly Labs, developed a carbon capture and reuse technology for its brewing process. The innovative technology captures carbon dioxide generated during the fermentation process and reuses it to carbonate the brewery's beer. This project, which is supported by $102,000 in TIER funding through Emissions Reduction Alberta, is estimated to reduce more than 1,000 tonnes of emissions per year by 2025.

Further deploying CCUS will help Alberta capitalize on other emerging opportunities like clean hydrogen, while reducing emissions across the energy sector and other industries, such as concrete and fertilizer. With more than 100 new projects in development worldwide, some estimate the CCUS industry will grow to be a $55 billion per year industry by 2030. It is expected to be responsible for 25 per cent of the emissions reductions required for the world to reach carbon neutrality by mid-century.

CCUS leadership in Alberta:

- The Government of Alberta has invested or committed $1.8 billion in CCUS projects.
- The Quest and the Alberta Carbon Trunk Line projects have already captured and permanently stored 10 Mt of emissions. Quest was one of the first functioning commercial-scale CCUS projects in the world.
- Alberta has decades of experience in the monitoring needed to demonstrate permanence and safety of storage.
- To help advance the development of this technology, Alberta is a member of various carbon capture and storage (CCS) networks such as the Global CCS Institute and the Plains CO_2 Reduction Partnership. Alberta is also taking part in global technology programs like Emissions Reduction Alberta's international partnership with Accelerating CCS Technologies (a collaboration of 15 research and innovation funding organizations) which included committing about $3 million from the TIER fund to the $19-million competition, where three Alberta-based projects were selected. The province strongly supports knowledge sharing efforts through partnerships like these.
- The Alberta Carbon Conversion Technology Centre in the Calgary area enables innovators to advance commercially viable carbon conversion and use technologies (using CO_2 captured from a neighbouring electricity plant) and the circular carbon market.
- To enable more CCUS projects and help meet the growing demand for carbon storage, Alberta is issuing carbon sequestration exploration agreements through a competitive process. Twenty-five hubs were announced in 2022. Ultimately, carbon sequestration agreements will be granted to successful proponent(s) that bid to manage these hubs, establish the boundaries of the location, and facilitate the hub manager role.

Alberta will continue to share its expertise and experience in Alberta, Canada and internationally to reduce global GHG emissions, including investing $3 million to establish a new hub to share CCUS knowledge, led by the International CCS Knowledge Centre. This centre will help to assess and identify best practices and frameworks to get CCUS projects to final investment.

To enable these projects to succeed, additional work with the federal government on a coordinated approach for CCUS incentives is needed. Through Budget 2023, Alberta has further reserved $387 million over five years for investments in future CCUS projects.

PART FOUR

Part 4: Opportunities and challenges

Alberta has both a unique economy and emissions profile, with energy-intensive and trade-exposed industries and resources that contribute to a high quality of life in the province and across Canada.

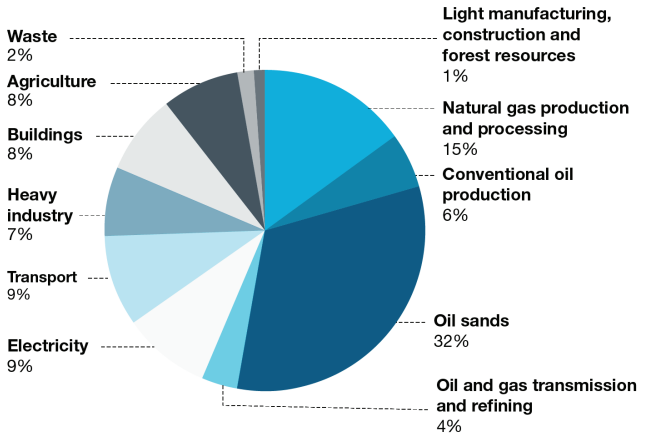
Alberta has an opportunity to dramatically reduce industrial emissions in the coming years and decades. Our challenge is to find innovative ways to do this, and to stay competitive as well.

Alberta's approach is to work with industry, Indigenous communities and organizations, municipal governments, academia, environmental organizations and others that are committed to emissions reductions. The Government of Alberta continues to collaborate with stakeholders to develop effective policy frameworks and innovation, supporting realistic and achievable outcomes. This is a key principle in a made-in-Alberta emissions plan.

Alberta understands the importance of an evidence-based, holistic and logical reduction plan that has all key sectors and industries engaged and committed to lowering emissions. Alberta has assessed and will continue to identify opportunities in each sector to reduce emissions, including technology pathways, the associated costs and potential timeframes, and the policies and programs needed to accelerate reductions. Comprehensive assessment of clean technology and innovation opportunities in each emitting sector is fundamental to setting technologically and economically achievable pathways to decarbonization. This work is underway and will be critical to charting the right pathways for Alberta to achieve carbon neutrality by 2050.

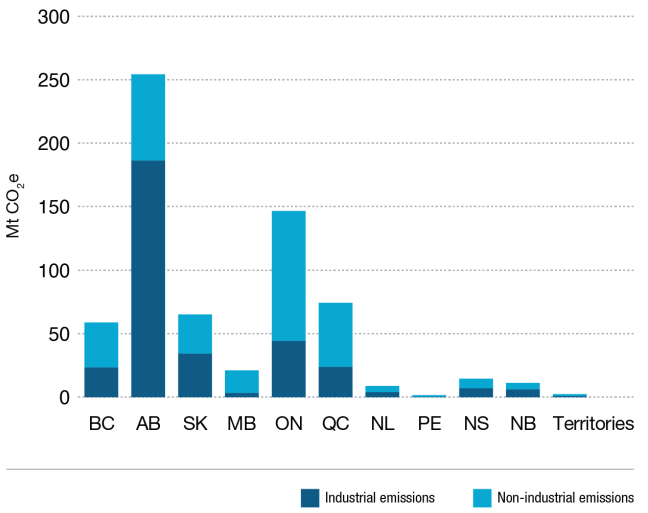
Each of the challenges below come with opportunities and solutions that are underway. The opportunities and solutions may be based in research, technology or innovation, or dependent on competitive realities and achievability.

Alberta's 2021 emissions profile



Data source: ECCC (2023) National Inventory Report

Canada's 2021 GHG emissions by province and the territories



Data source: ECCC (2023) National Inventory Report

	Challenge	Opportunity
Oil Sands	**Oil sands emissions:** The oil sands sector accounts for 32% of Alberta's total emissions.	**The Pathways initiative:** Six major oil sands producers, representing 95% of oil sands production, have struck a consortium to develop a plan to get to net zero. The Pathways initiative is the single largest emissions reduction challenge in Alberta's 118-year history. It includes the construction of one of the largest CCUS project in the world. This opportunity, reducing emissions by 22 Mt or almost 10% of Alberta's provincial total, requires support from the federal government, the Alberta government and Indigenous leadership. This CCUS initiative will further decrease the emissions associated with Alberta's conventional oil production.
Oil and Gas	**Conventional oil and gas emissions:** The second largest source of emissions in Alberta is from Alberta's conventional oil and gas sector. This cross-section of upstream and midstream producers represents 21% of Alberta's total emissions. The single greatest challenge for conventional producers is to continue to substantially reduce methane emissions. Alberta's total methane emissions as of 2021 are split among the energy sector 65%, agriculture 25% and waste 10%. The federal government's recent increased methane reduction target to at least 75% by 2030 from 2012 levels presents a unique challenge, especially because the federal government intends to limit its approach to a prescriptive and more costly approach. The federal oil and gas emissions cap (on conventional oil and gas and oil sands and potentially downstream refining) is expected to have a disproportionate impact on Alberta – including cuts to production, cuts to investment in clean technology and cuts to jobs. And it will result in carbon leakage with increased production in less responsible countries.	**Reductions of methane and leadership:** This challenge has been taken up by our conventional oil and gas leaders. Alberta is on track to meet its 45% methane emissions reduction target by 2025. Alberta's conventional oil and gas producers have been leaders in emissions management, well ahead of those in other jurisdictions. Alberta was the first oil and gas producing jurisdiction to put requirements on emissions from flaring, starting in the early 1990s and continuing to add requirements and mechanisms to reduce venting, flaring and fugitives. Alberta's approach is results-oriented and tailored to the sector, using a combination of regulatory requirements, market-based incentives to drive early reductions, and programs to support accurate measurement and transparent reporting. Alberta will continue to invest in clean technology and innovation for continuous improvement in the oil sands and conventional oil and gas sectors, while also diversifying energy sources including hydrogen, biofuels and critical minerals for batteries.
Electricity	**Federal net zero electricity grid by 2035:** Between 2005 and 2021, electricity sector emissions fell from 48.7 Mt to 22.5 Mt, representing an absolute reduction of nearly 53%. Accelerating the displacement of coal with natural gas has significantly reduced emissions, and coal will be eliminated as a feedstock in 2023, seven years ahead of schedule. The federal government's clean electricity regulation requires net zero emissions by 2035. It does not consider the significant harm to Albertans and Canadians in terms of affordability and reliability, which are critical for the safety of households and competitiveness of business. It also does not reflect what is technologically feasible by 2035.	**Balancing electricity affordability and reliability with emissions reductions:** Recent inflation, the increased cost of living and overall affordability challenges in Alberta must be considered. The Alberta government sees an opportunity for further emissions reductions from the electricity sector through CCUS, hydrogen, renewables and other technology. However, Alberta will not forfeit the affordability and reliability of the system in pursuit of unrealistic federal targets. The Alberta Electric System Operator has estimated the cost to achieve the federal net zero target to be more than $44 billion dollars (not including distribution system change costs). Accompanying the increase in costs is an increased reliability risk. This plan reflects the necessity of natural gas being the predominant feedstock for electrical generation for many years to come.
Transportation	**Lowering emissions from transportation:** Emissions from the transportation sector represent 9% of Alberta's emissions annually. The challenge of lowering these emissions in large trucks, trains, airplanes and passenger vehicles, as well as associated infrastructure, requires innovation, research, deployment of technology and systems modernization.	**New and low-emitting fuels, innovation and leadership:** The Alberta government sees an opportunity to work closely with industry leaders to support their advancements. The introduction of hydrogen for vehicles, buses, rail and airlines is underway through various pilot projects and the announcement of several refueling stations. Industry leadership along with clean hydrogen produced with CCUS will help the transportation sector achieve lower emissions.

Part 5 of this document provides more information on the individual emitting sectors in Alberta's economy. Specifically, what we have already done to reduce emissions, our ongoing actions, and what comes next. The Alberta government is assessing each of the sectors outlined in Part 5 to determine achievable pathways to decarbonization, both technological and economic. Alberta will identify opportunities in each sector to reduce emissions, the costs and technologies associated, the potential time frame, and the policies and programs needed to accelerate reductions.

Implications of the federal emissions reduction plan

Alberta's approach is to forge a plan that is ambitious yet achievable and supports deployable pathways to reduce emissions and ensure energy security. Alberta and Canada cannot afford to take blunt, inefficient, one-size-fits-all approaches to drive our emissions down. This would result in a negative economic impact that will be felt by Canadians for generations to come. Harmful policies include the proposed federal oil and gas emissions cap, the proposed federal clean electricity regulation, and the proposed federal methane regulations for oil and gas. These policy approaches are designed to be national in nature, but most of the impact will be felt in Alberta.

Alberta agrees with the need to aggressively reduce emissions but recognizes it must be done at a pace that can leverage innovation and technology, some of which is not commercially available and scalable today or in the near future. The proposed federal oil and gas emissions cap layers complexity and costs onto Canadian oil and gas producers at a time when North American and global energy security is paramount. It places the sector at a disadvantage in international markets at a time when global demand for oil and gas is growing. The cap will not result in global emission reductions but will result in carbon leakage along with a transfer of production, wealth and jobs to other less reliable and less environmentally responsible jurisdictions.

Alberta is committed to robust and evidence-based policy frameworks, with understanding and communication of the environmental, social and economic impact of policy choices, such as the impact on household costs and industry competitiveness. As of yet, the federal government has not provided Canadians with a measure of the impact, in whole or in part, of its 2030 Emissions Reduction Plan. To ensure all Canadians are well informed about the implications of the federal plan, the Government of Alberta has hired an independent third-party to assess its socio-economic impacts and proposed policies.

Carbon leakage occurs when emissions and economic activity from one jurisdiction moves to another jurisdiction because of less stringent climate policy, resulting in no change to global emissions, but simply a shift of economic activity. Alberta recognizes the importance of reducing emissions, however, hastily designed or more stringent policies than proposed would come at significant cost to the province due to lost competitiveness, with little to no impact on global emissions due to carbon leakage. This plan supports Alberta's economy and industries while driving near-term incremental improvements with appropriate incentives for longer-term transformative technologies that will prepare Alberta for further increases in stringency as peer and competitor jurisdictions act.

Though the Canadian government has introduced several incentives and programs aimed at lowering emissions, many of the programs are complicated and have unnecessary conditions. The federal government needs to significantly increase its support for decarbonization and make supports easily accessible to industry. Furthermore, there is a need for enhancements to the federal regulatory process to deliver timely and transparent decisions for investors.

The Canadian government is a partner in this journey. But it must participate in a positive and supportive fashion that reflects Canada's opportunity to be a global supplier of oil, natural gas, hydrogen, critical minerals and ammonia. As the owner of our own resources, Alberta looks forward to federal support and participation as a leader in emissions reductions and energy development.

Competing for Investment

Alberta is not alone in its aspiration to reach carbon neutrality by 2050. Other jurisdictions are competing to attract the private sector investment needed to reduce emissions from our current industries and to grow future opportunities.

Alberta has a competitive business environment, the appropriate geological conditions, skilled labour and a policy framework that makes it ideal for investment into renewable energy, CCS, clean hydrogen, critical minerals, and more. Alberta, along with the federal government, must ensure it remains the location of choice for new investment into low-emitting energy technologies, future fuels and processes, particularly in the context of the United States' *Inflation Reduction Act*.

Alberta's ongoing assessment of technology pathways to abate emissions includes assessment of the competitiveness of Alberta in attracting investment into various clean technology projects. Alberta will collaborate with the federal government to maximize attraction of investment.

PART FIVE

Part 5: Emissions reductions across Alberta's economy

Most of Alberta's emissions are from industrial sectors. Therefore, much of the government's policy and programming have been tailored to these sectors to achieve the greatest reductions at the lowest cost, one example being industrial carbon pricing and emissions trading. These innovations have been replicated in other jurisdictions. Alberta's leadership will continue with key commitments in each of the sectors critical to our economy.

Further, Alberta has led in other sectors that present opportunities for emissions reductions, including buildings, transportation, agriculture and forestry. Alberta is committed to exploring investment and action in these sectors as well.

Oil and Gas – Conventional, oil sands and bitumen beyond combustion

The global energy system is undergoing unprecedented change. The disruptions caused by Russia's aggression against Ukraine have impacted all European countries and forced many to seek out more reliable markets for their energy. With energy security now a top priority of every country, Canada and Alberta can provide clean, reasonably priced, responsibly produced energy to insulate global partners from geopolitical risk and economic hardship.

In particular, LNG distribution should be developed as a clean substitute for burning coal, which has become an unfortunate outcome of the war in Ukraine. Alberta's vast gas reserves combined with a practical emissions reduction plan should be a pathway to an emerging clean hydrogen economy, plastics recycling, and petrochemical diversification, as well as LNG. Alberta's natural gas production is fully integrated, and it ensures all Canadians receive broader social and economic benefits from these vital resources.

Alberta's oil sands represent 95 per cent of Canada's oil reserves. In 2021, Alberta produced 62 per cent of Canada's natural gas and 85 per cent of Canada's oil and equivalent. Ensuring Alberta continues to responsibly produce our resources while reducing our emissions footprint is a cornerstone of this plan.

Conventional oil and gas

The conventional oil and gas industry is a key component of the provincial economy. It accounts for thousands of jobs and contributes to government revenues, which support a high quality of life in the province and the rest of Canada. It operates in one of the world's most stringent regulatory environments through Alberta's legislation, regulation and policy. Alberta Environment and Protected Areas sets thresholds to minimize the impact of oil and natural gas developments on air, land and water.

Natural gas is a reliable and predictable energy source in Canada's climate. It is a clean option for electricity generation and industrial process heat, and is an essential feedstock for ammonia, plastics, methanol and hydrogen production. Natural gas has the unique benefits of high combustion efficiency, reliable and affordable distribution in pipelines, flexibility of use and lower emissions. Given its clean-burning properties, natural gas is trending globally as a replacement for coal and oil in the decades to come.

Canada can contribute to global emissions reductions by increasing natural gas production and LNG exports to coal-reliant countries, even if it results in fewer emissions reductions from the natural gas sector domestically. Policies that diminish Canada's role as a global supplier of natural gas may do more harm than good from a global perspective – which is the perspective that matters.

What we have already achieved

- Alberta's approach to reducing methane emissions from flaring, venting and fugitives is an international best practice and has won national and international awards.
- Alberta has a long-standing partnership approach to development of methane policy and programs, working with industry, environmental non-governmental organizations, Indigenous businesses, academia, technology service providers and others. We have established ambitious, innovative and implementable frameworks: Alberta's Clean Air Strategic Alliance (CASA) in 1994 reduced flaring volumes of solution gas by approximately 50 per cent. CASA continues to tackle complex air quality challenges.
- Alberta was the first sub-national government in North America to set a methane reduction target for upstream oil and gas, namely 45 per cent from 2014 levels by 2025. Alberta's combination of regulation, market-based incentives and programs are cost-effective and internationally recognized as best practices for methane reduction.
- In Alberta, natural gas has replaced coal as the primary source for electricity production seven years ahead of schedule.

Alberta was the first oil and gas producing jurisdiction to put requirements on emissions from flaring, starting in the early 1990s, and has continued to add requirements and mechanisms to **reduce venting, flaring and fugitives**, including being the first sub-national government in North America to set a methane emissions reduction target in 2015.

From 2014 to 2019, Alberta reduced gas flaring and venting volumes by 30 per cent and 65 per cent, respectively.

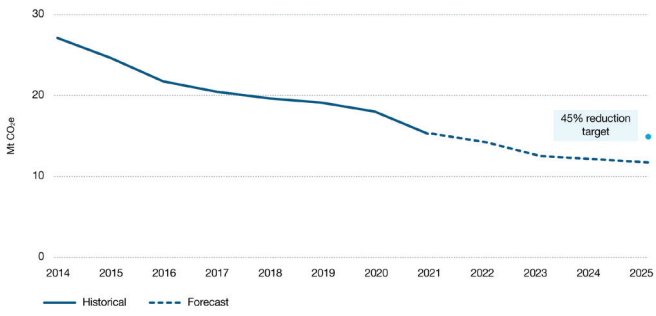
Alberta's innovative and outcomes-based approach to flaring and venting policy has won national and international awards. It has been used as an example in other jurisdictions.

- Alberta experts were used to calibrate international methane satellites in the 2000s.
- CASA's Flaring and Venting reduction project received the Canadian Council of Ministers of the Environment Pollution Prevention Award in 2005.
- Alberta's flaring standards were adopted as a model among neighbouring provinces and internationally. They were given an Excellence Award by the World Bank's Global Gas Flaring Reduction Partnership in 2015.

Ongoing actions and results

- Alberta achieved a 45 per cent reduction in methane emissions from the oil and gas sector between 2014 and 2022, meeting and being on track to surpass our goal for a 45 per cent reduction by 2025.
- To support the methane emissions policy, Alberta established a working group in 2022 with experts from academia, industry and associations, Indigenous businesses, ENGOs and technology service providers. The working group assessed the effectiveness of the policy to achieve the 2025 target and provided recommendations for government.
- The Methane Technology Implementation Program has supported projects at oil and gas sites that are anticipated to reduce methane emissions by 17 Mt over the lifetime of the technologies. This program is supported by $25 million from Alberta's TIER fund.
- Alberta has a transparent reporting system, long established and continuously improved. Since the 1990s, oil and gas sites have reported to the Alberta Energy Regulator their routine and non-routine flaring and venting. As well, since 2004 large facilities (including conventional oil and gas and other sectors) have been reporting methane emissions to Alberta Environment and Protected Areas through the Specified Gas Reporting Regulation. The government and regulator have produced regular reports such as ST60B: Upstream Petroleum Industry Emissions Report and Methane Emissions Management from the Upstream Oil and Gas Sector in Alberta.

Alberta's 2021 emissions profile



Data source: Alberta Energy Regulator's compliance reporting 2014 to 2021 and estimates to 2025

- Alberta's Natural Gas Vision and Strategy envisions growth in five sectors of the natural gas industry: petrochemical manufacturing, hydrogen, Alberta industrial demand, LNG, and the plastics circular economy.
- Alberta has taken advantage of the proven strengths of our natural gas sector in the following ways:
  - Advancing CCS technology in the supply chain upstream and mid-stream, supported by a broad sequestration opportunity across the province.
  - Accelerating the path to a circular economy with a province-wide recycling and diversion system for plastics.
  - Supporting the implementation of Alberta's Hydrogen Roadmap given the emerging market demands for clean hydrogen and Alberta's position in leading this new diversification opportunity.
  - Working with other governments to build out Canada's LNG opportunity in support of clean displacement of coal and other higher-emitting energy sources.
  - Evaluating all aspects of the supply chain for ammonia to ensure Alberta's production can support global food production as a critical feedstock for fertilizer.

A barrel of oil produced through the process of **EOR has a lower carbon footprint than many competing sources of crude oil**. According to the Clean Air Task Force, a barrel of oil produced using CO_2 EOR emits 37 per cent fewer CO_2 emissions on a life cycle basis compared to conventional production.

What's next

- Alberta will continue to share its experience and learnings on methane emissions reductions from the oil and gas sector with other jurisdictions embarking on methane reduction initiatives.
- Alberta Environment and Protected Areas will engage stakeholders, Albertans, and Indigenous organizations to assess potential pathways to achieve a provincial 75 to 80 per cent methane emissions reduction target from the conventional oil and gas sector by 2030 (from 2014 levels). The pathways will use a combination of regulations, market-based incentives and programs, complemented by continuous improvement in measurement and reporting. It will focus on cost-effective, outcomes-based approaches.
- The Alberta Energy Regulator will evaluate the working group's recommendations for improving the efficiency of its directives and reducing red tape to support methane emissions reductions in the conventional oil and gas sector.
- Alberta is committed to advance technology and innovation through the TIER regime. We will also enable emissions reduction strategies that encourage the replacement of higher-emitting fuels in Asia with environmentally responsible Alberta energy.

Oil sands

Alberta's oil sands represent the fourth-largest proven oil reserves in the world. With more than 160 billion barrels of reserves, the oil sands are a significant contributor to oil production both provincially and globally. It is therefore imperative that Alberta be a leader in emissions reduction. The *Alberta Oil Sands Emissions Limit Act* sets a 100-Mt limit on emissions. In 2020, emissions from covered sources were approximately 70 Mt.

The six largest oil sands producers, representing 95 per cent of production in the oil sands, have joined together to form the Pathways Alliance. Its goal is to achieve net zero from their operations by 2050.

Indigenous Peoples' involvement in responsible energy development in Alberta is growing.

The Fort McKay and Mikisew Cree First Nations own 49 per cent of the Fort Hills oil sands project's East Tank Farm. Completed in 2017, the $545-million deal is one of the largest business investments to date by a First Nations entity in Canada. The economic benefits of ownership include funding social programs, education and training, and developing business capacity and building infrastructure, according to Mikisew Cree First Nation.

Source: Canadian Energy Centre, More Indigenous communities are taking the lead in oil & gas, February 22, 2023

What we have already achieved

- Industrial carbon pricing and emissions trading systems that have been in place since 2007 have incentivized oil sands facilities to further reduce emissions. Oil sands facilities have followed an evolving technology pathway and improved their technology, starting with more effective extraction, then shifting to more efficient cogeneration systems, use of paraffinic froth treatment for tailings, and use of solvents to displace more energy-intensive stream generation.

Ongoing actions and results

- The emissions intensity of bitumen has fallen 21 per cent per barrel over the past decade. It is anticipated that leading producers will further reduce that intensity up to 23 per cent over the next decade.
- Alberta has amended the TIER Regulation to further reduce emissions from oil sands mining, in situ and upgrading facilities. The amendments include a tightening of two per cent per year in the stringency of regulatory benchmarks for 2023 to 2028, increasing to four per cent annually in 2029 and 2030. This helps to provide the signal and certainty needed to make investment decisions.
- The TIER regulatory system continues to incent the development and use of low-emitting energy in the form of cogeneration for oil sands sites while providing excess electricity back to the grid.
- CCS and the use of small modular nuclear reactors (SMRs) hold the potential to significantly reduce emissions from oil sands production, allowing bitumen to be produced with lower emissions intensity than other crudes. This will be critical, as demand for bitumen will increase for non-combustion feedstocks.

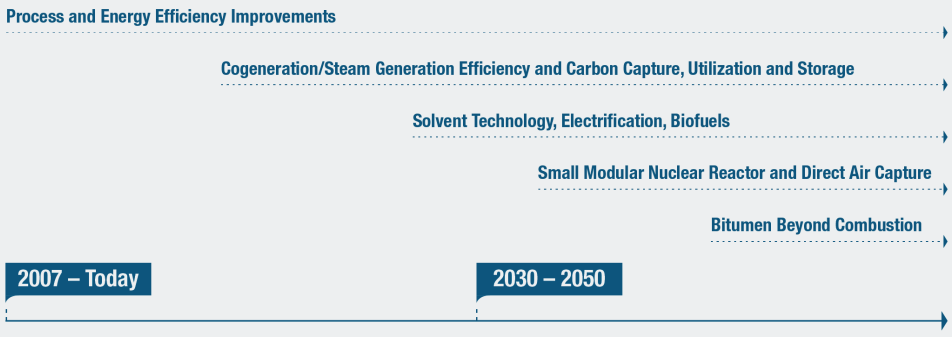
What's next

- Alberta will explore reducing the provincial legislated oil sands emission limit and implementing regulations that align with the Pathways Alliance targets to reduce net emissions in the sector for 2030, 2040 and to achieve carbon neutral emissions by 2050.

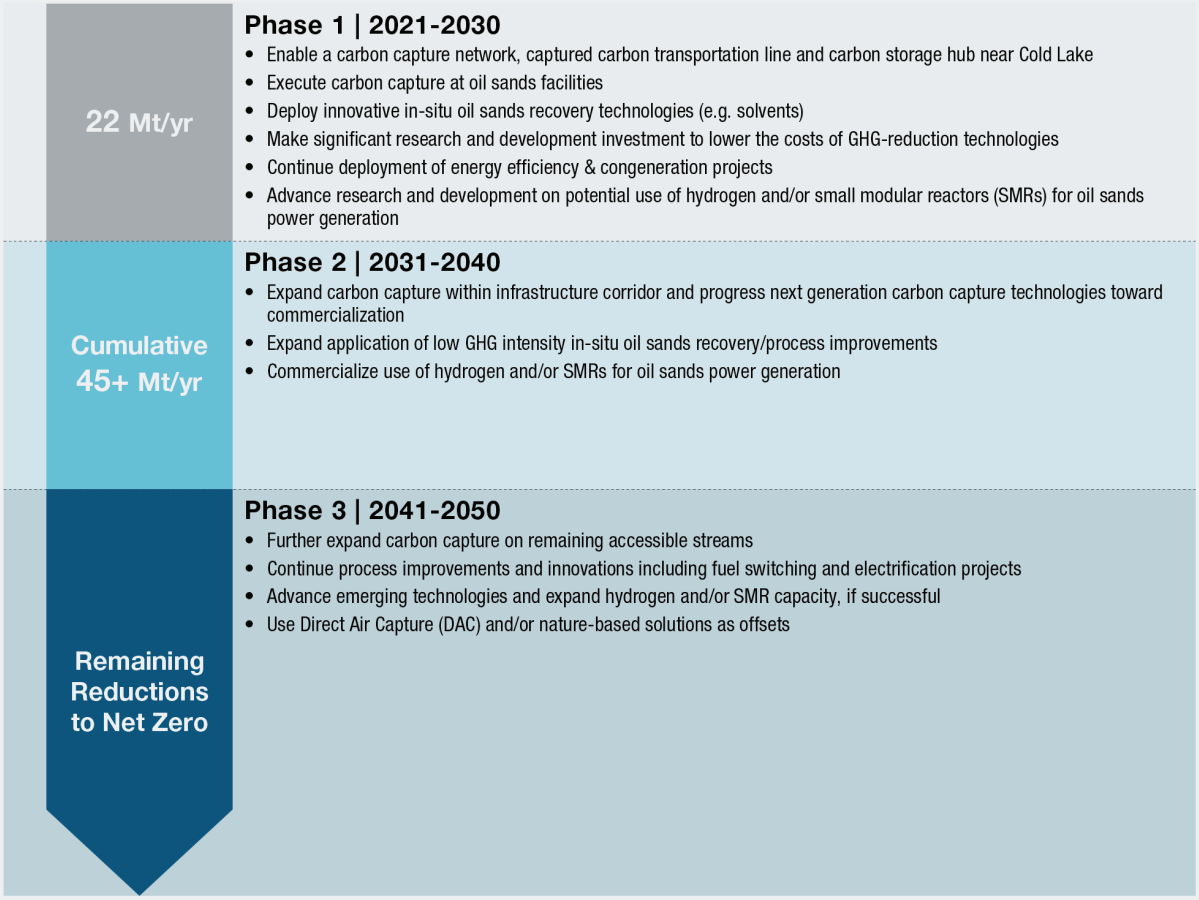
Technology and innovation continue to reduce the footprint of oil sands production.

- The Suncor PURE (Partial Upgrading Reduced Energy) facility is demonstrating an innovative partial upgrading technology that has the potential to reduce GHG emissions, improve market access for Alberta oil sands products, and lower production costs. PURE is intended to reduce diluent requirements for transportation and to increase the value of oil sands bitumen.
- At the Base Plant Cogeneration unit, Suncor is in the process of converting the petroleum coke-fired boilers to natural gas cogeneration units. The project is expected to be in service between 2024 and 2025, and to reduce emissions by about one Mt per year. The unit will produce roughly seven per cent of the current power demand in Alberta.
- In 2021, oil sands mines used less fresh water, and produced more oil, than in the previous five years, approximately 23 per cent lower than in 2017. In 2021, about 90 per cent of the total water used for oil sands in situ operations came from recycled sources, and the remaining 10 per cent was make-up water from nonsaline and alternative sources.

Oil sands emissions reduction technology path



Pathways Alliance net zero GHG emissions plan for oil sands operations by 2050



Pathways Alliance (2023)

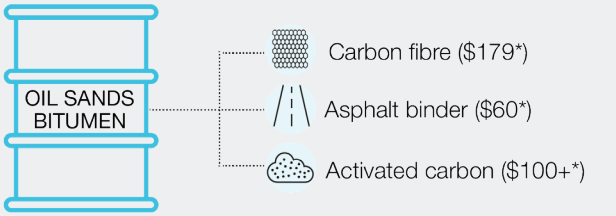
Preliminary data, subject to change. References to net zero apply to emissions from oil sands operations (defined as Scope 1 and Scope 2 emissions). All emissions reductions are contingent on Pathways companies achieving the fiscal, policy and regulatory certainty necessary to advance decarbonization projects.

Bitumen beyond combustion

Oil sands production is not limited to the production of fuels. Alberta Innovates is exploring bitumen beyond combustion (BBC) through research and development of new value-add opportunities for bitumen. Alberta Innovates has discovered practical uses for bitumen. These include using bitumen as an asphalt binder to make stronger and longer-lasting roads, as a carbon fibre that provides a low-emission, lightweight alternative to steel, and as an activated carbon material.

Alberta Innovates estimates that BBC products could generate up to $60 billion annually by 2050. These products would create demand for oil sands bitumen regardless of oil demand from the transportation sector.

Bitumen beyond combustion products per barrel



**Value of the BBC product that can be extracted from a barrel of bitumen*

Adapted from: Alberta Innovates (2021), Bitumen Beyond Combustion

The Surmont Energy Ltd. Wildwood Project is Alberta's **first proposed greenfield oil sands project for bitumen beyond combustion**. It would expand oil sands production and achieve substantial Indigenous ownership of bitumen production and value-added processing. The project would commercialize innovative processing technology developed by the University of Calgary. If built, it would produce up to 12,000 barrels per day undiluted hot liquid bitumen. It would use steam-assisted gravity drainage (SAGD) technology integrated with an asphalt splitter plant to process hot liquid bitumen into asphalt binder.

Ongoing actions and results

- Alberta Innovates launched the Carbon Fibre Grand Challenge in 2020, a $26-million three-phase competition to accelerate the development of large-scale production for short and continuous carbon fibre from bitumen-derived feedstocks, and to promote their use in manufactured products. Alberta Innovates, the Clean Resource Innovation Network and a committee of experts selected the 12 best projects from phase two, which will be completed by summer 2023. They include but are not limited to:
  - Edmonton-based AdvEn Industries Inc. is developing a project that would produce 300 tonnes per year of activated carbon, with plans to expand production more than threefold.
  - Alberta bitumen contains up to 50 per cent asphalt binder, more than any other crude source. Several companies are working on processes to produce asphalt binder from bitumen.

What's next

- Alberta will explore means to support BBC research and development, including technology development and policies regarding demand for BBC products, such as carbon fibre and strong, resilient asphalt.
- Alberta will explore ways to enhance Indigenous participation in projects for BBC.

Electricity

Alberta's electricity sector has undergone significant change in response to technology, government policy and the growing use of electricity in a host of applications. Electricity demand in Alberta increased approximately 30 per cent over the past two decades, and there has been a corresponding increase in investment to add capacity. A trend towards electrification in heating and transportation is expected to lead to further demand.

At the same time, GHG emissions from Alberta's electricity sector have fallen significantly. Between 2005 and 2021, electricity sector GHG emissions fell from 48.7 Mt to 22.5 Mt, representing an absolute reduction of nearly 53 per cent. By 2030, according to the Alberta Electric System Operator's 2021 Long Term Outlook, Alberta's power sector is forecast to reduce GHGs by 61 per cent from 2005 levels.

Modelling of the Alberta electricity market suggests that Alberta's TIER regulatory system and the energy-only market will continue to send strong incentive signals for electricity generation that are efficient, low cost and low emitting. The energy-only market favours the most economic generation sources. It is supporting more zero-priced energy than ever before – largely wind and solar (although it must be noted that these sources are intermittent). It has done this while effectively shifting investment risk from consumers to private companies, enabling competition to put downward pressure on prices and increase innovation.

Alberta's electricity supply is anticipated to change between now and 2040 with retirement of coal, less efficient natural gas-fired electricity, as well as more uptake of lower-emitting technologies, such as renewable energy, cogeneration, and CCS for natural gas and hydrogen. These last two are expected to play a long-term role in Alberta beyond 2035 as a reliability backstop.

Renewable energy, including wind and solar, is proving to be effective in lowering prices of electricity when available. However, the grid cannot run on these intermittent sources alone.

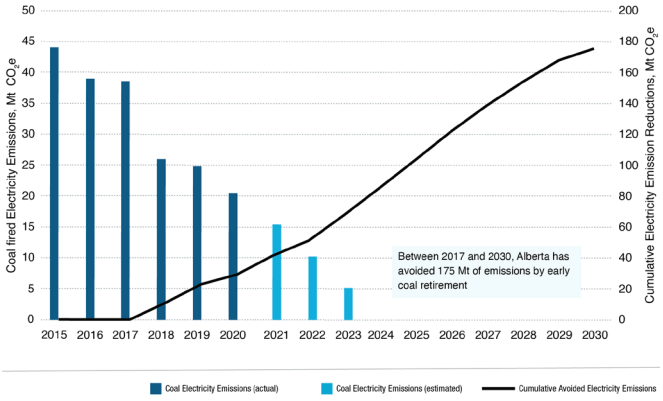
Natural gas is expected to play a key long-term role in Alberta beyond 2035. Future investment in technologies such as energy storage and clean hydrogen will likely complement natural gas as a reliability backstop but, in the near term, as more intermittent wind and solar generation have come online, reliable, firm and "on-demand" generation are required to ensure power is available when needed. In Alberta, natural gas-fired generation currently provides these essential services and will be the backbone of Alberta's electrical grid for decades to come.

What we have already achieved

- Alberta expects to be off coal by the end of 2023, seven years ahead of our target for 2030. Alberta has also emerged as the leading jurisdiction in Canada for renewable electricity investment.
- Coal once provided over 80 per cent of the province's electricity and as recently as 2016, supplied roughly 50 per cent of Alberta's electricity. This represents the biggest GHG emissions reduction in Alberta's history and an unrivaled achievement by any other Canadian jurisdiction.
- Alberta's *Renewable Electricity Act* includes a legislated requirement that 30 per cent of electricity be produced from renewable resources by 2030. Through a fair, efficient, openly competitive electricity market and the TIER regime, Alberta has attracted 5,677 megawatts (MW) of renewable capacity on the grid and over $2.7 billion in investment in utility-scale renewable projects that are currently under construction. This investment will bring the capacity of renewables at utility scale to almost 9,000 MW. The Canadian Energy Regulator forecasts Alberta will be Canada's leader in growing renewable energy capacity in the next three years. In fact, of the 1.8 gigawatts (GW) of new wind and solar capacity installed in Canada last year, nearly 1.4 GW (or nearly 80 per cent) was in Alberta.

Cumulatively between 2017 to 2030 Alberta has avoided 175 Mt of carbon dioxide equivalent emissions by getting off coal early.

Early off coal emissions reductions



Data source: Alberta Electric System Operator

Ongoing actions and results

- Alberta's electricity system is modernizing by integrating new low-carbon technologies and innovations, such as energy storage. It is changing the way electricity producers and consumers interact with the power grid, for example, by helping the distribution system plan for electric vehicles, renewable power and other distributed energy resources. Alberta is providing long-term benefits for both consumers and the electricity industry.
- Alberta is committed to maintaining a reliable electricity system, including the necessary supply of dispatchable electricity – sources of electricity that can be called on nearly instantaneously, including natural gas, hydroelectric, hydrogen and energy storage.

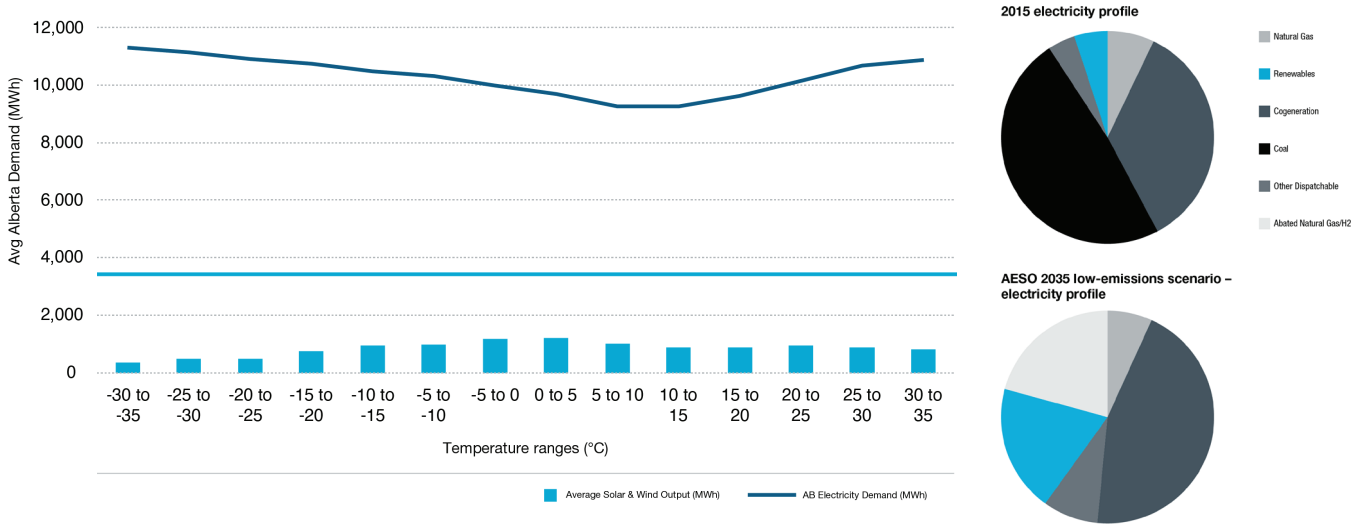
Three Nations Energy is a corporation owned by Athabasca Chipewyan First Nation, Mikisew Cree First Nation and Fort Chipewyan Métis Association. It completed Canada's largest off-grid solar farm, which provides 25 per cent of the annual electricity needs of the hamlet of Fort Chipewyan. The project helped Indigenous tradespeople, workers and contractors to build their skills in the green energy sector.

Capital Power has invested about $440 million since 2020 to add 270 MW of new wind and solar capacity, increasing its Alberta renewable portfolio to 620 MW. The company remains committed to investment in Alberta renewables, including proceeding with 151 MW Halkirk 2 Wind, subject to regulatory approval.

TransAlta continues to advance Alberta renewable projects as part of its overall target of developing 2 GW of renewables projects between 2021 and 2025. TransAlta operates Alberta's first industrial-scale battery storage facility, co-located at a wind facility, and is advancing a 180 MW battery storage project at an existing hydroelectric facility in the province.

The Travers Solar Project is a $700-million development near Lomond in Vulcan County. It is being built as a partnership between Greengate Power Corporation and Copenhagen Infrastructure Partners. Now operational, it is the largest solar farm in Canada, with a capacity of 465 MW.

Electricity demand and supply from wind and solar at various temperatures



Data source: Alberta's Electric System Operator

What's next

- Alberta's economic and energy future requires a diverse electricity grid that is resilient during high demand periods. A strategic path towards decarbonizing Alberta's electricity sector, focused on reliability and affordability, will maximize the use of current infrastructure, reduce the risk of stranded assets, incent technology development and deployment, and provide high-quality jobs.
- Government, industry, agencies, Indigenous communities, and all Albertans have an important role to play as we move away from large-scale power plants supplying energy in one direction through transmission and distribution lines to end-use consumers.
- Today's electricity consumers are savvy, and the province will need to enable "prosumers" to generate their own electricity, as well as manage demand and energy efficiency, to reduce overall energy use. These will progress alongside measures to reduce the price of every electron and supporting infrastructure.

- Government will continue to work with consumers, industry and regulators on approaches to support new technologies, including storage and demand-side management (DSM) that will improve the efficiency, reliability and fairness of Alberta's electricity system while also supporting emissions reduction. Studies conducted for the province of Alberta have highlighted the range of benefits that DSM programs can offer, such as energy savings, energy efficiency, peak demand reductions, GHG emissions reductions and more system flexibility.
- Alberta is reviewing its distribution and transmission policies to ensure ongoing reliability, affordability and coordinated efforts to increase efficiency.
- Technology and innovation advancements from across the globe are centered on decarbonizing electricity. Additional diversification of low-emitting technologies in Alberta, including CCUS, hydrogen and SMR will provide a more robust electricity grid going forward.
  - New CCUS technologies are expected to capture more than 90 per cent of carbon dioxide emissions from power plants.
  - Alberta's hydrogen roadmap identifies hydrogen-fired gas turbines, combined-cycle gas turbines, and fuel cells as playing a role to reduce emissions in the electricity sector while maintaining grid reliability.
  - SMR are a new and versatile technology that can supply non-emitting energy in different applications, including electricity. Alberta is working with other provinces to ensure the appropriate regulatory framework is in place should the private sector pursue SMRs.
- Recognizing the significant cost of decarbonizing Alberta's electricity grid in comparison to other jurisdictions, our province is disproportionally impacted by federal policies like the proposed Clean Electricity Regulation. Alberta is advocating for meaningful federal financial support to maintain affordable, reliable electricity while moving toward low-emitting generation.
- Alberta will consider energy management supports to continue driving energy efficiency and emissions reduction projects in industrial and commercial facilities.

ENMAX is developing a large-scale carbon capture facility at its Shepard Energy Centre, which will be the first of its kind in North America, as there are no projects that capture CO_2 emissions from an existing natural gas combined-cycle electricity generation facility.

Capital Power's Genesee CCS project will use carbon capture technology at its new repowered Genesee 1 and 2 units. They will be the most efficient combined-cycle units in Canada upon completion of the Genesee repowering in late 2023. The separate Genesee CCS project is anticipated to start capturing carbon as early as 2027, capturing 95 per cent of the CO_2 emitted from the repowered units and delivering about 3 Mt of annual CO_2 reductions. Capital Power announced limited notice to proceed in December 2022 and is targeting a final investment decision in late 2023.

Heartland Generation has announced its Battle River Carbon Hub project at the Battle River Generating Station, which includes an open-access carbon sequestration hub that will capture and sequester carbon emissions from Heartland Generation and other industrial sources in the region, safely and permanently. Heartland Generation's carbon hub will be Canada's first large-scale 100 per cent hydrogen-fired electricity generation facility, integrating hydrogen production, CCS and clean power to advance Canada towards net zero.

The Suncor ATCO Heartland Hydrogen Hub (SAH3) in Alberta's Industrial Heartland will be operated on 100 per cent clean hydrogen-fired cogeneration units, using hydrogen produced on site to generate power and steam, with excess power sold back to the grid.

Geothermal energy

Geothermal is a clean, renewable source of energy that has the potential to help Alberta meet its demand for power and heat, including but not limited to enhancing energy and community resiliency for Indigenous and remote communities.

According to the Canadian Geothermal Energy Association, there is an estimated potential of 388,500 MW of thermal energy in Alberta that can be recovered under existing technical, structural and ecologic restrictions. Alberta is well positioned to attract investment in this growing industry, with our suitable geology, expertise in drilling technology, and extensive oil and gas experience.

What we have already achieved

- In 2021, Alberta established the *Geothermal Resource Development Act* to set a regulatory regime to advance geothermal investments. The Alberta Energy Regulator released its rules and directives for geothermal resource development in 2022, providing clear requirements for project proponents and investors.
- In 2021-22, Alberta invested $28 million in geothermal resource development and the critical minerals strategy, including mapping of targeted geoscience for the public.
- In 2022-23, Alberta invested $41 million to support the expanded mandate of the Alberta Energy Regulator in the implementation of a lifecycle regulatory framework for geothermal and critical minerals.

Ongoing actions and results

- Alberta is encouraging made-in-Alberta technology to promote economic development in municipalities as well as energy and community resiliency for Indigenous and remote communities.
- There is increasing interest in geothermal energy development in the province, ranging from co-production projects with oil and gas and critical minerals to standalone geothermal projects, including the repurposing of inactive oil and gas infrastructure.
- Since the new regulations took effect on January 1, 2022, the Alberta government has received 74 applications for tenure and issued 31 leases.
- Pilot projects in Alberta have received over $50 million in funding from several sources, including Alberta Innovates.

What's next

- We will work to position Alberta as an international geothermal hub by engaging with industry, academia, Indigenous communities and other stakeholders by advancing technology and promoting its adoption at a global scale.

The Derek Riddell Eavor-Lite™ Demonstration Facility is a full-scale prototype of the Eavor technology suite. Intended to demonstrate the **world's first scalable form of clean baseload power**. The facility site is located near Rocky Mountain House. Eavor-Lite™ consists of two vertical wells, joined by two multilateral legs at 2.4 km depth, connected by a pipeline at surface. This design, which is not intended to be commercially viable, aims to prove and demonstrate all the critical elements of Eavor's technologies at the lowest cost.

Terrapin's Alberta No. 1 geothermal energy project is the **province's first conventional geothermal heat and power facility**. Located in the Municipal District of Greenview, it is anticipated to provide 10 MW of clean electricity and 985 terajoule per year of clean heat.

Hydrogen

Hydrogen is the most abundant element in the universe. When burned for energy or used in a fuel cell, it emits only water, which means it has the potential to be a major source of clean energy. Alberta's resources enable large-scale production of low-cost and low-carbon intensity hydrogen — also known as clean hydrogen — that is highly competitive in the rapidly growing global hydrogen market.

Alberta is reducing local carbon emissions by integrating clean hydrogen throughout our economy. Large-scale adoption of clean hydrogen in Alberta's energy sector could reduce provincial emissions by 14 Mt per year.

Alberta is already Canada's largest hydrogen producer, producing approximately 2.4 Mt of hydrogen per year for various industrial applications. Production of hydrogen with a low emissions intensity will continue to improve with technology such as CCUS and renewable electricity.

Alberta has the resources, expertise and technology needed to quickly become a global supplier of clean, low-cost hydrogen. With a worldwide market estimated to be worth over $2.5 trillion a year by 2050, Alberta aims to integrate clean hydrogen at scale into the province's energy system for use in transportation, heat, power generation and renewable energy storage, industrial use, and export markets. Alberta can leverage its existing natural gas reserves, renewable energy resources, extensive pipeline network and energy infrastructure to play a leading role in Canada and the world's clean hydrogen economy.

Air Products is constructing a **net zero hydrogen energy complex near Edmonton**, which is expected to begin operations in 2024. The facility will produce clean hydrogen from natural gas and CCUS and includes a liquefaction facility that will support transportation markets across Western Canada.

Dow Inc. announced plans to build the **world's first net zero carbon emissions ethylene and derivatives complex** near Edmonton. The production process will convert cracker off-gas into hydrogen as a clean fuel to be used in the production process, and carbon dioxide would be captured and stored by CCUS infrastructure.

What we have already achieved

- Alberta's Hydrogen Roadmap, released in 2021, is our path to building a provincial hydrogen economy and accessing global markets. It will provide support to the sector as technology and markets develop.
- Alberta is supporting hydrogen opportunities across the value chain through innovation and technology programs delivered by Emissions Reduction Alberta and Alberta Innovates.
- In 2022, the Government of Alberta provided $50 million in funding to establish the Hydrogen Centre of Excellence. It supports innovation across the entire hydrogen system, from production to end use. It includes a funding program, testing and service facility, and forum for facilitating partnerships to de-risk hydrogen technology development. It focuses on five target markets that have the most economic opportunity for Alberta, including heating, exports, transportation, industrial processes, and electrical generation and storage.

Emissions Reduction Alberta and Alberta Innovates have invested more than $92 million in **35 hydrogen projects**, including $15 million in Air Products' Canada Net-Zero Hydrogen Energy Complex, $7 million in the Alberta Zero Emissions Truck Electrification Collaboration, and close to $5 million in the two electric buses in Edmonton and Strathcona County powered by hydrogen fuel cells and now in road trials.

Alberta's competitive investment environment has attracted numerous proposed hydrogen projects and alliances, including:

- Suncor ATCO Hydrogen Project: early-stage design and engineering for a clean hydrogen project near Fort Saskatchewan.
- ITORCHU Blue Ammonia and Blue Methanol Production Facility: uses natural gas to produce blue ammonia for export, primarily to Japan.
- Air Products' Canada Net-Zero Hydrogen Energy Complex: a $1.3 billion auto-thermal production facility producing natural gas-based hydrogen.
- Mitsubishi and Shell blue hydrogen facility: a low-carbon hydrogen production facility near where hydrogen will be converted to ammonia for export to Asian markets.
- Edmonton Region Hydrogen HUB: an alliance of government, Indigenous, and economic development organizations looking to kick-start the Edmonton Region's hydrogen economy.
- Southeast Alberta Hydrogen Task Force: a task force led by Invest Medicine Hat, including government and industry, supporting a study that will identify broader economic opportunities associated with large-scale clean hydrogen in southeast Alberta.

Ongoing actions and results

- The Alberta Petrochemicals Incentive Program helps companies attract investment in new or expanded market-driven petrochemical facilities for hydrogen projects.
- The industrial carbon pricing and emissions trading system enabled through the TIER regulation is an important support for clean hydrogen production in Alberta. The amendments to the TIER Regulation for 2023 forward ensure that hydrogen production and use with CCUS is recognized for emission reductions. The amendments support growth of clean hydrogen.

What's next

- Alberta Energy accepted expressions of interest in early 2023 from parties interested in providing information about designing, building, operating and owning hydrogen refueling stations to primarily serve the heavy-duty transportation sector. The Alberta government can then determine the conditions that need to be in place for private industry to develop these stations.
- Alberta will continue to implement the Hydrogen Roadmap to achieve provincial outcomes, with initiatives that include:
  - Exporting 2 Mt per year of clean hydrogen and hydrogen carriers to global markets by 2030.
  - Using existing natural gas infrastructure to blend hydrogen in low volumes with natural gas for residential and commercial utility heating.
  - Enabling the transition of heavy-duty diesel vehicles to hydrogen fuel cell electric vehicles.
  - Adding CCUS to hydrogen production facilities to reduce emissions by 12 Mt per year.
- Alberta will support hydrogen innovation by investing $25 million from the TIER fund in Emissions Reduction Alberta to support investments in hydrogen development and the hydrogen value chain. We will work with Alberta Innovates' Hydrogen Centre of Excellence on a coordinated approach for technology investments that support the emerging hydrogen economy and the objectives of Alberta's Hydrogen Roadmap.
- Alberta will work with stakeholders to address challenges with transportation of hydrogen and ammonia in order to access global markets.

Critical minerals

Demand for critical minerals is growing globally in response to population growth, advancing technology and the global shift to a lower-carbon economy. Alberta's abundant resources, infrastructure and expertise in responsible resource development position the province to be a global supplier of choice to support energy security. Critical metals, including lithium, uranium and vanadium, helium and titanium, are needed for wind turbines, batteries, electric vehicles, energy storage cells and other products. Alberta's innovative and entrepreneurial spirit, seen throughout the over 100-year history of oil and gas production in some of the most challenging conditions on earth, has led to the development of technologies, workforces, and infrastructure that can supply the world with affordable, reliable energy now and into the next century.

Alberta has established the Renewing Alberta's Mineral Future strategy and action plan. They will capitalize on our potential to become a preferred producer and supplier of metallic and industrial minerals and mineral products.

The mineral strategy includes advancing opportunities for Indigenous Peoples. The participation of Indigenous Peoples, entrepreneurs and businesses in mineral exploration and development – as well as along the mineral supply and value chains – allows for a better understanding of the opportunities, interests and potential concerns identified by Indigenous communities. The success of Alberta's critical mineral development is tied to the active participation of Indigenous Peoples.

Canada, the United States, the European Union and Japan have identified more than 30 minerals that are classified as critical for infrastructure, electronics, national security and the transition to a low-carbon economy. Alberta has a potential supply of many of those minerals, and the province is well-positioned to become a preferred producer and supplier of metallic and industrial minerals and mineral products.

What we have already achieved

- Informed by strategic advice, guidance and recommendation from the Mineral Advisory Council and consultations, Alberta released Renewing Alberta's Mineral Future in 2021 – a strategy and action plan for Alberta to become a preferred producer and supplier of critical minerals. It promotes responsible and efficient exploration, development, manufacturing, and recycling of minerals and mineral products.
- The *Mineral Resource Development Act* establishes the Alberta Energy Regulator as the full life cycle regulator for Alberta's brine-hosted mineral development. The act will further advance Alberta's strategy and action plan. This one-window approach will provide clarity, certainty and a streamlined regulatory environment for industry and investors that assures environmentally responsible development, opportunities for Indigenous Peoples, and promotion of innovation.
- In 2021-22, Alberta invested over $25 million to support the Alberta Energy Regulator and Alberta Geological Survey to build an inventory of minerals and their concentrations across the province. The Alberta Geological Survey's interactive 3D mapping tool for minerals has been greatly enhanced by work done through grants under Renewing Alberta's Mineral Future's strategy and action plan.[12]

[12] https://ags.aer.ca/research-initiatives/mineral-mapping-program.

Ongoing actions and results

- Alberta is supporting industry to develop technologies to extract critical minerals from various sources, including lithium from brines, vanadium from ores and oil sands, titanium and rare earth elements from oil sands and helium. These are used for medical technology, high-tech manufacturing, space exploration and national defense.
- Direct lithium extraction technologies are being developed to unlock lithium-brine resources found in Alberta.
- Alberta remains committed to working with First Nations, Metis Settlements, other Métis communities, and Indigenous organizations. The government is supporting Indigenous participation and partnerships in the natural resource and energy economy.
- Alberta is working nationally and internationally to advance energy and mining development across Canada, coordinating support for projects and supply chains for critical minerals and supporting all natural resources sectors in becoming global suppliers for environmental, social and governance industries.

E3 Metals Corp, an emerging lithium developer and leading **direct lithium extraction technology innovator**, recently received a $1.8 million grant from Alberta Innovates that will assist in funding its pilot plant.

Summit Nanotech, a Calgary-based company, is testing its own environmentally friendly extraction process that uses **nanotechnology to extract lithium from brine water.**

What's next

- Alberta will continue to enhance its public geological knowledge base so governments, the public, industry, landowners and Indigenous communities have a better understanding of Alberta's resource potential.
- Alberta will continue efforts to create a competitive business environment and to attract investment into critical minerals.
- Alberta will focus work on a strategic list of minerals identified from the Canada and United States list of critical minerals.
- The Government of Alberta will explore efforts to support Alberta's helium industry, through outreach efforts with the federal government.

Circular economy and waste

Circular economy solutions can contribute to widespread environmental, economic and social benefits by reducing the impacts of material production, processing and disposal, as well as supporting economic diversification into lower-emissions products.

A circular economy can support economic diversification. It will also keep valuable materials out of landfills while supporting investment, bolstering economic activity, and creating jobs.

What we have already achieved

- Alberta's recycling economy supports about 7,500 direct jobs. Increasing our recycling has the potential to create an additional 13,300 jobs and $1.4 billion in economic activity.
- In February 2023, Emissions Reduction Alberta announced that up to $58 million from the TIER fund would help develop projects as part of the Circular Economy Challenge. Successful projects have the potential to create about 1,800 jobs and cut emissions by up to four Mt by 2050.

Heidelberg Materials (previously Lehigh Cement) is working with the City of Edmonton to receive 30,000 tonnes per year of refuse to derive fuel for the purpose of generating low-carbon electricity and heat for its cement plant in Edmonton.

Ongoing actions and results

- Alberta's government established a new Extended Producer Responsibility (EPR) Regulation in 2022, focused on single-use plastics, packaging and paper products as well as hazardous and special products. EPR shifts the cost and management of recycling from municipalities and municipal taxpayers to those directly producing and consuming goods. This encourages companies to produce less waste and packaging and come up with innovative ways to recycle more. It is estimated that a shift to an EPR system for single-use products, packaging and paper products in Alberta could create 220 new jobs and reduce GHG emissions by 72,000 tonnes annually.
- Alberta is actively working to address provincial policy, legislative and regulatory barriers to advance a plastics circular economy, including:
  - Developing a roadmap to facilitate investment in innovative technology.
  - Undertaking a plastics feedstock study and market assessment to determine areas of greatest opportunity and barriers to overcome.
  - Implementing the EPR framework for materials management, which will take effect in 2025. A plastics circular economy will keep these materials in the economy and out of the landfill.
- Continue to reduce methane emissions at landfills through the TIER Regulation and carbon offset incentives that provide protocol for aerobic composting and landfill gas capture and combustion.

Alberta Innovates has invested $4.5 million of TIER funds to support NOVA Chemicals Corporation and Enerkem Inc. to pilot their **chemical recycling technology**. The technology converts syngas produced from used, non-recyclable and non-compostable plastics to feedstock for plastics. The technology could reduce GHG emissions by approximately 165,000 tonnes per year and also divert 230,000 tonnes of waste (including over 100,000 tonnes of mixed plastic waste) per year from landfills.

Alberta supported the **world's first commercial-scale facility to convert municipal waste to renewable methanol and ethanol**. The Enerkem facility is located at the Edmonton Waste Management Centre of Excellence and has attracted delegations from all over the world to learn from the innovative technology that turns non-recyclable and non-compostable municipal solid waste to biofuels and renewable chemicals.

Calgary Aggregate Recycling Inc., an Indigenous-owned company, received TIER funds through Emissions Reduction Alberta to construct Canada's first **construction and demolition (C&D) waste recycling plant**. The C&D waste recycling plant's world-class technology maximizes recycling and minimizes environmental impact, while bringing cost-competitive aggregate and waste-to-value products into the Alberta market. This plant and technology align with Alberta's sustainability needs and priorities, focusing on material re-use, waste reduction, emissions reduction and economic growth.

What's next

- Alberta will establish an EPR system to manage single-use plastics, packaging and paper, and hazardous and special products by 2025.
- Alberta will continue to support industry innovation, stewardship and accountability for plastics end-of-life management.
- Alberta will work to establish Alberta as the Western North America centre of excellence for plastics diversion and recycling by 2030, including:
  - Research and development for advanced chemical and renewable, low-carbon plastics recycling.
  - Province-wide plastics recycling and diversion systems in place.
  - Cross-jurisdictional coordination of plastics diversion and advanced recycling that achieves critical economies of scale.

Bioenergy, transportation and buildings

Bioenergy includes renewable natural gas (RNG), bioethanol, biodiesel and other chemicals made from biomass resources. Biomass sequesters carbon when it grows so the GHG emissions when it is combusted are part of the natural carbon cycle; biomass does not release additional emissions and is considered carbon neutral.

Bioenergy can be used as a blending agent to reduce GHG emissions from the combustion of traditional fuels. This offers a promising pathway to reduce emissions without substantially changing established infrastructure, consumer behaviour and in-place technologies. For example, natural gas and RNG are nearly identical in their chemical composition so they can be mixed, processed, stored, transported and used the same way. As RNG is produced by capturing bio-methane that would otherwise be released from landfills, wastewater or farm and wood waste, it can benefit the waste, agricultural and forestry sectors.

What we have already achieved

- Alberta incents biofuel and biogas projects through the TIER regulatory system and carbon offsets. This includes landfill gas, diverted organic waste, animal manure and wastewater projects. Activities that can generate carbon offsets are outlined in the protocols for biofuel production and usage, biogas production and combustion, and landfill gas capture and combustion carbon offsets.
- Alberta is supporting emissions reductions in other jurisdictions. Most of the bioenergy produced in Alberta, particularly RNG, is shipped to British Columbia for transportation and natural gas heating.

The largest biodiesel plant in Canada is Archer-Daniels-Midland Agri-Industries in Lloydminster. Permolex (Red Deer) is a zero-waste facility with an alcohol biorefinery that uses food waste to produce ethanol.

The Two Hills RNG facility combines organic waste from nearby municipalities with agricultural waste to produce approximately 230,000 gigajoules per year of renewable natural gas, enough to fuel 2,500 homes and avoid up to 20,000 tonnes per year of carbon dioxide equivalent emissions.

Canary Biofuels received $4.7 million in TIER funding through Emissions Reduction Alberta to create a $28.6-million facility in Lethbridge County that will produce about 70 million litres of high-value renewable fuel. A first-of-its-kind facility in Canada, it will turn local agricultural waste, inedible animal fats and used cooking oil into biodiesel fuel and glycerin. The facility will buy more than $375 million of local feedstock from farmers over a period of five years, generating about $500 million in revenue, supporting up to 130 local jobs, and reducing about 224,000 tonnes of emissions annually.

Royal Dutch Shell, one of the world's largest distributors of biofuels, worked with Edmonton-based SBI BioEnergy to produce a drop-in renewable fuel using Alberta-grown non-food canola and animal fat.

West Fraser Slave Lake Pulp received TIER funding to support the building of a biomethanation project to generate electricity for its pulp mill.

Ongoing actions and results

- Major new liquid biofuels projects have been announced in Alberta, with a combined value of over $2.5 billion creating more than 1,400 jobs, including:
  - ATCO Energy Solutions and Future Fuel is building a RNG facility north of Vegreville. Emissions Reduction Alberta has committed $7.9 million of TIER funding to the project through its Natural Gas Challenge.
  - Future Energy Park is a $1.2 billion proposed investment in Alberta located within Calgary city limits that will create approximately 800 construction jobs and 50 operations jobs. It will be North America's largest carbon-negative biofuels facility, intending to capture biogenic CO_2 from its ethanol and RNG processes to go beyond net-zero emissions. Emissions will be transported and permanently sequestered. Alberta's TIER pricing, strong agricultural and energy sector expertise, and early-stage funding by Emissions Reduction Alberta served as catalysts for this project.
  - Strathcona Refinery Renewable Diesel Expansion in Edmonton is a $720-million project by Imperial Oil Ltd. to produce 20,000 barrels per day of renewable diesel in 2025 and reduce emissions by about 3 Mt annually compared to conventional fuels. It will be the largest facility of its kind in Canada, and it will support other provinces to reduce their emissions.

What's next

- Engaging with stakeholders, the Alberta government will explore the establishment of a low-carbon gaseous minimum blend rate for utility natural gas, including renewable natural gas and/or hydrogen, and also the development of policy to achieve this blend rate without risks to affordability, reliability and safety.
- Alberta is moving forward with a new agri-processing tax credit program for corporations investing $10 million or more to build or expand agri-processing facilities in the province. The government will provide a 12 per cent non-refundable tax credit against eligible capital expenditures.

Transportation

Alberta is acting to lower emissions across the transportation sector, including reducing fuel carbon intensity, supporting fuel switching and taking other measures. Several alternatives to conventional gasoline and diesel are currently available, including battery electric, hydrogen fuel cells, compressed natural gas, biofuels, LNG and propane. Emissions in the sector have recently started to decline, primarily because of increased telecommuting.

Alberta has the energy and refining expertise as well as innovation capacity to create new fuels at scale for aviation, rail, heavy-duty vehicles and passenger vehicles.

The information below supplements the action, results and commitments listed above related to both bioenergy and transportation.

What we have already achieved

- Alberta's Renewable Fuels Standard (RFS) Regulation includes minimum requirements for blending renewable fuels into gasoline at five per cent and diesel at two per cent. Also, blended renewable fuels must demonstrate at least 25 per cent fewer GHG emissions on a life cycle basis than their fossil fuel equivalent. Since the RFS was established in 2011, more than 6 Mt of emissions have been reduced from transportation, and thousands of jobs have been supported in the bioenergy sector in Alberta, particularly in rural areas.
- The province of Alberta has made significant investments in public transit, including $2 billion in the Green Transit Incentives Program (GreenTRIP), $3.6 million in the Rural Transportation Pilot Program, $1.53 billion for the Calgary Green Line LRT, and $1.47 billion for Edmonton's West Valley Line, Metro Line Extension and Capital Line Extension projects.
- Municipalities across Alberta continue to act, including:
  - The Alberta Zero Emission Hydrogen Transit $10-million project is demonstrating two hydrogen fuel cell electric buses in Edmonton and Strathcona County.
  - Edmonton is the first city in Canada to run both hydrogen fuel-cell electric and battery electric buses, and it has the first hydrogen maintenance facility in the region.
  - The City of Calgary launched a Green Fleet initiative to investigate options around fully electric, electric hybrid and other low-carbon vehicle technologies. Calgary has a $14-million e-transit demonstration and deployment pilot project, supported by TIER funding through Emissions Reduction Alberta. The project focuses on the introduction of zero-emission battery electric buses.
  - With TIER funding provided through the Municipal Climate Change Action Centre's Electric Vehicles for Municipalities Program, the Town of Millet purchased a new electric Zamboni for its Agriplex. By switching to electric, the town will be reducing any operational emissions, leading to a reduction in environmental impact, as well as significantly lower fuel and maintenance costs. This electric vehicle is expected to reduce overall emissions by about 66 per cent compared to the traditional propane-powered ice re-surfacers.

Ongoing actions and results

- Emissions Reduction Alberta is involved in projects and initiatives, including funding research projects on lower-emitting vehicles such as:
  - Alberta Zero Emissions Truck Electrification Collaboration to advance the performance of hydrogen-fuel cell heavy-duty trucks.
  - Canadian Pacific's building of North America's first line-haul hydrogen-powered locomotive using fuel cells and batteries.
- The Government of Alberta continues to invest in the Municipal Climate Change Action Centre to provide funding, technical assistance and education to municipalities and community organizations, including programs for electric vehicle charging stations on municipally owned property.
- Sustainable aviation fuel, along with hydrogen and electrification, holds significant potential to decarbonize the aviation sector. Alberta has a direct interest and commitment to grow and diversify the aviation sector, and the Government of Alberta signed a memorandum of understanding with WestJet Airlines that includes working to develop sustainable aviation fuel at scale in Alberta. Given the strategic importance of the development of a sustainable aviation fuel in Alberta to industry, consumers and the environment, the Government of Alberta is committed to working with appropriate partners on the development of sustainable aviation fuel that can be deployed commercially.

In 2022, WestJet, headquartered in Calgary, announced that it will be the first Canadian air carrier to operate a dedicated flight route using sustainable aviation fuel in a step towards decarbonizing Canada's aviation sector.

What's next

- Alberta will engage stakeholders in a review of the Renewable Fuels Standard Regulation. The review will look at increases to the minimum requirements for blending for ethanol and bio-based diesel and for fuel emission intensity reductions, as well as changes to policy architecture and expanding the regulation to include other fuels such as sustainable aviation fuel.
- Alberta will continue to work with industry and others to assess and plan infrastructure that supports the use of alternative-fueled vehicles, such as hydrogen and electrification.

Buildings

Most emissions from buildings are a result of space and water heating as well as electricity used in cooling, lighting and appliances, making energy efficiency improvements central to reducing emissions and saving money.

The information below supplements the action, results and commitments listed above related to both bioenergy and buildings.

Lubicon Lake First Nation, Beaver Lake Cree Nation, Louis Bull Tribe and Fort McKay First Nation have each installed solar power systems on their community-owned buildings, drastically reducing their energy bills and carbon footprint. The projects range from 20 kilowatts (kW) to nearly 200 kW in capacity.

What we have already achieved

- $55 million has been provided by Emissions Reduction Alberta's Energy Savings for Business Program for energy efficiency projects at office buildings and small and medium-size facilities.
- Since 2009, Alberta's Municipal Climate Change Action Centre has helped implement energy efficiency and renewable energy solutions to more than 300 organizations, including municipalities, non-profit organizations and schools.

The Municipal Climate Change Action Centre (MCCAC) is a partnership of Alberta Municipalities, Rural Municipalities of Alberta and the Government of Alberta, supported by the TIER fund. Since 2009, the MCCAC has supported:

- 839 clean energy projects
- 389 participating organizations including 164 Alberta municipalities
- 885 job years
- 29.6 MW installed electricity capacity, including 75,592 solar solar photovoltaic (PV) modules
- $157 million in lifetime energy savings
- More than 728,000 tonnes of lifetime GHG emissions avoided

In 2021, the **Village of Longview** completed the installation of a new solar PV system on unused land at the sewage lagoon. The 256 solar panels generate enough power to offset energy consumption from all municipal operations including at the centennial park, generator building, community hall, sewer station, rest stops, streetlights and campground – making the Village of Longview now carbon-neutral in its municipal operational energy consumption. The 115.2 kW solar PV system is conservatively estimated to generate 150,797 kilowatt hours per year.

The **Métis Crossing Solar Project** is a collaboration between the Town of Smoky Lake, Smoky Lake County and the Métis Nation of Alberta. The project is receiving a $3.9-million investment from the MCCAC for its successful application to the Municipal Community Generation Challenge. The Métis Crossing Solar Project will be in Smoky Lake County at Métis Crossing—a signature cultural site of Métis people in Canada. The project was conceptualized as a key initiative of the Métis Nation of Alberta Climate Change Action Plan after engaging with over 300 Métis citizens across 18 Alberta communities.

Ongoing actions and results

- In 2023, Alberta adopted Tier 1 of the new national building and energy codes for energy efficiency as the minimum province-wide standard for building energy efficiency, which will lead to greener building construction in Alberta, while still prioritizing housing affordability. Tier 1 will come into force in spring 2024.
  - Alberta has jurisdiction over safety and building codes, as do all Canadian provinces and territories. Alberta participates in the process to develop the national model building codes and regulates their adoption in a timely manner.
- The *Act to Enable Clean Energy Improvements* gives municipalities an innovative approach to finance residential and commercial energy efficiency and renewable energy projects. The Clean Energy Improvement Program provides Albertans affordable, flexible and streamlined financing, covering up to 100 per cent of project costs, to be repaid through regular property tax bills. The following municipalities have voluntarily set up a Clean Energy Improvement Program:
  - Residential property programs, including detached and semi-detached homes, townhouses and low-rise apartment building have been established in the Town of Athabasca, City of Calgary, Town of Canmore, Town of Devon, City of Edmonton, City of Leduc, City of Lethbridge, Town of Rocky Mountain House, and City of St. Albert. Six other communities are expected to launch programs for residential property owners in the coming year.
  - Commercial property programs, including offices, shopping centres, hotels, warehouses, farmland and more have been established by the City of Edmonton.

What's next

- Alberta will continue to engage with stakeholders to determine if and when a higher energy efficiency tier for buildings should be adopted.
- Alberta will explore education and awareness measures related to energy performance and benchmarking of buildings in Alberta, focusing on new builds and major retrofits.
- Alberta will assess clean technology, low-carbon building materials and innovation opportunities for residential, commercial and industrial buildings.
- In addition to $13 million previously committed, Alberta will invest $15 million over three years to support municipalities, communities and Albertans to enhance energy security and reduce energy use and emissions through the MCCAC.

Agriculture

Alberta farmers and ranchers are well-established land stewards. They continue to make operational and technological improvements to lower their carbon and environmental footprint, while improving productivity and resilience to a changing climate to support global food security.

Alberta has the **largest irrigated land area** in Canada, and over 83 per cent of these lands within the irrigation districts meet best water management practices, making water available to communities and supporting aquatic ecosystem health. Alberta's irrigated land makes up almost 70 per cent of all irrigated acres in Canada.

Alberta's 11 Irrigation Districts deliver water through a system comprising almost 8,000 km of canals and pipelines. The system includes 41 irrigation storage reservoirs that provide reliable water to 1.5 million acres of irrigated land, 50 municipalities, abundant wetlands and water-based recreation activities. Alberta's irrigation infrastructure supports $5.4 billion of provincial GDP, $3.2 billion in labour income and almost 50,000 jobs. Initially designed and constructed over 100 years ago to provide water to agricultural producers in areas with a variable climate, the infrastructure continues to securely provide water to mitigate drought and flood events across the southern region.

A crucial aspect in adapting to more extreme weather events is the irrigation sector's commitment to water conservation, efficiency and productivity planning. This is implemented through infrastructure upgrades and modernization, on-farm irrigations system changes and increased crop productivity, enabling increased domestic and international food production and saving of water for other users. Between 2005 and 2014, Alberta saw a 26 per cent improvement in water efficiency and a 22 per cent productivity increase in irrigation districts. This means water is available to support ongoing economic and municipal development while also supporting continued aquatic ecosystem health in surface waterways.

What we have already achieved

- Alberta provides and promotes climate smart agriculture strategies that can reduce emissions, enhance sequestration and enhance capacity to adapt to climate variability. Examples include conservation tillage, nitrogen management, continuous cropping, planting trees or windbreaks, perennial cropping, irrigation infrastructure modernization and increased energy efficiency.

Alberta is managing emissions associated with **fertilizer production and use**. Fertilizer production facilities are regulated under the TIER system. Alberta also has management tools in place to assist producers with optimizing farm inputs, which reduces emissions, such as the Alberta Farm Fertilizer Information and Recommendation Manager and the NERP for carbon offsets. The NERP is based on improving nitrogen fertilizer efficiency, putting more in the crop and less in the air as nitrous oxide, a potent GHG. Projects that are implemented according to NERP generate carbon offsets by using a 4R Nutrient Stewardship Plan, a science-based agricultural framework that considers collectively the source, rate, time, and place practices for fertilizer and other crop nutrients (Right Source of Nutrients at the Right Rate and Right Time in the Right Place).

4R Nutrient Stewardship requires the implementation of site-specific best management practices that benefit agronomic productivity and produce a reduction in environmental impact by optimizing the efficiency of fertilizer use – this is, to match nutrient supply with crop requirements, minimize nutrient losses and reduce intensity of GHG emissions from fertilizer use. An added benefit of 4R is a potential savings in fertilizer costs due to more efficient use of fertilizer on farm. A 2022 survey indicated nearly all western Canadian farmers surveyed follow basic 4R right-time practices when applying nitrogen in the fall after soils have cooled or in the spring.

- The Canadian Agricultural Partnership is a federal-provincial investment of $406 million in the agricultural sector in Alberta, with five-year programs that wrapped up in March 2023. New programming for the Sustainable Canadian Agricultural Partnership is outlined below.
- Alberta's TIER regulatory system supports food processing facilities and also incents emissions reductions through carbon offsets, covering nitrous oxide from fertilizers and methane from beef production.
- Alberta's carbon offset protocol for conservation cropping has established it and no-till management as standard practice. From 2002 to 2021, over 17 Mt of carbon offsets were generated by farmers implementing low or no-till practices. This involved over 18,000 landowners and more than 8,000,000 acres. The protocol was successful and has been withdrawn as it is now business-as-usual practice in the province. Other jurisdictions have adapted and adopted Alberta's protocol to reduce their emissions.
- Alberta has long established the aggregation of carbon offset projects to support updated emissions reduction practices at agricultural operations of all sizes. Our innovative approach has attracted the attention of other jurisdictions looking to reduce emissions in the agricultural sectors.

Alberta's innovative approach to aggregation is yielding results.

The carbon offset system is designed to enable farmers and smaller operators to participate by enabling aggregation of their projects together to reduce the administrative cost and barriers to monetizing the reductions.

Service providers and project proponents referred to as aggregators have acted on this opportunity since 2007, driving innovation in business practices and in project configuration to enable greater levels of participation in the offset system, therefore delivering further reductions across the economy.

These aggregators have expanded beyond Alberta's borders over time, with a significant portion providing their expertise in other emission trading systems.

- Alberta's rangeland stewardship policies and programs are designed to maintain range and riparian health along with other objectives such as carbon storage, as the organic carbon stored in Alberta's rangelands is equivalent to about three times the annual GHG emissions in Canada. Alberta is focussed on protecting native grasslands, converting marginal cropland to rangeland, and restoring disturbed areas.

Private landowners have **voluntarily restored grasslands** adding carbon sequestration capacity to Alberta lands. Guardians of the Grasslands is a short documentary made by a group of conservationists, ranchers and Canadian filmmakers that explores the currently endangered state of the Great Plains grasslands, conservation of this ecosystem and the role that cattle play in its survival.

DSM is working with Alberta with a consortium of agricultural partners to advance a feed additive to significantly reduce methane emissions from cattle and other ruminants. For example, the large-scale **Project Clean Cow** demonstration showed a 70 per cent reduction in enteric methane emissions.

A growing demand for biogas and RNG helps diversify the agricultural sector through increased opportunities to manage waste. Biodigesters create nutrient recovery opportunities and suport GHG reductions.

Ongoing actions and results

- Agricultural stewardship in Alberta is having a positive impact.
  - Alberta is second-lowest in Canada for nitrous oxide emissions intensity from fertilizer.
  - Summer fallow acres in Alberta dropped by 92 per cent between 1985 and 2022, thereby lowering associated emissions.
- The Government of Alberta is expanding agricultural production and diversifying value-added food processing by investing $280 million to modernize and expand irrigation infrastructure. Though increased conveyance efficiency, Alberta aims to increase the total irrigated area up to 93,000 hectares, creating up to 7,400 new permanent jobs, and enhancing annual GDP by $483 million. The irrigation industry contributes $5.4 billion to provincial GDP, which represents about 28 per cent of the agri-food sector GDP on only 4.4 per cent of the cultivated land base.

What's next

- Alberta is committed to exploring new and existing best management practices for GHG emissions reduction and removal. This includes assessing ecosystem services provided by agriculture, which are currently not captured in traditional markets.
- The new Sustainable Canadian Agriculture Partnership programs are set to begin accepting applications in April 2023. The changes will focus on investment and growth of the agriculture, agri-food and agri-processing industry in Alberta, encourage innovation and technological advancement on-farm and in value-added facilities, and maintain our pledge to grow public confidence in the agriculture industry. The program also includes the Resilient Agricultural Landscape Program, which is an initiative to mitigate climate change and support the agricultural sector in better addressing sustainability outcomes.
- Alberta will continue to ensure that the environmental stewardship of agricultural producers in the province is recognized and that our agricultural commodities continue to play a major role in meeting global food security needs.
- Alberta is assessing opportunities to expand and refine agricultural emissions reduction protocols, such as the Nitrous Oxide Emission Reductions Protocol, to increase usability and reduce data burden.

Forestry

Alberta's robust regulatory framework is based on world-leading sustainable forest management principles. A healthy, well-managed forest supports natural carbon sequestration, cultural and traditional values, watershed functions, biodiversity, recreational opportunities, and a valuable fibre supply for industry. It also facilitates new investment and jobs in the growing bioeconomy.

Forest biomass can be used to produce heat and power, as well as harvested products used for building. It can play a role in carbon sequestration and the circular economy.

Indigenous groups hold 1,057,910 cubic metres (m^3) of forestry tenure, representing 3.1 per cent of the provincial total, with eight First Nations and one Métis group holding 14 different tenures. These Indigenous groups control commercially viable tenure holdings ranging from 50,000 m^3 up to 550,100 m^3.

The Loon River, Whitefish Lake, Woodland Cree and Lubicon Lake First Nations own and operate the Kee Tas Kee Now (Limited) Sawmill, which is supplied from both the First Nations owners' allocations and other regional First Nations and Métis harvesting allocations.

What we have already achieved

- Over 98 per cent of forest harvesting in Alberta occurs on public lands and supports a competitive and world-class forest sector. Companies harvesting timber on public lands are legally required to reforest. Alberta's forest industry plants roughly three trees for every tree harvested, and planted more than 100 million trees in 2022.
- Forestry companies develop 200-year forest management plans and have strict requirements to ensure long-term forest sustainability. Harvest plans incorporate wildfire, insect and disease risks to reduce unplanned disturbance and widespread tree mortality that can lead to carbon release. Consultation with Indigenous communities and the public is required for all forest management plans.
- Alberta's wildfire program consists of comprehensive prevention and mitigation, public communication and a focus on early wildfire detection.
- The Forest Health and Adaptation program ensures Alberta's forests remain healthy and viable by monitoring and controlling forest insects and diseases, regulating and developing forest reproductive materials, and conservation of genes.
- The Alberta Tree Improvement and Seed Centre ensures the seeds planted on public land are genetically adapted to present and future climate.

Ongoing actions and results

- Nearly 21 million hectares of land are held under certified sustainable forest management in Alberta today, up from two million hectares in 2000. This represents over 83 per cent of the province's forests that are under long-term forest tenure, a proportion larger than that of most countries.
- Alberta's forest products such as lumber, plywood, oriented strand board and pellets have a lower carbon footprint than many alternative products. They are produced sustainably and in a renewable manner, and they are in demand at home and around the globe.
- Forest industry bioenergy capacity in Alberta has expanded rapidly in recent years. The forest industry has become a reliable supplier of baseload power generated from woody biomass and bioenergy products, as companies have made significant investments in electricity generation and wood pellet production capacity.

Alberta has aggressive **wildfire and pine beetle programs** that reduce the risk of widespread tree mortality. Mountain pine beetle management has been aggressive since 2006 and is an overwhelming success in Alberta. Since 2019, pine beetle populations declined provincially by 94 per cent. Similarly, our wildfire program regularly achieves 95 per cent of wildfires controlled before 10 a.m. after the wildfire is detected and assessed.

What's next

- Alberta will continue to identify forest and forest sector vulnerabilities and lead policy and action plans to address them.
- Alberta will:
  - Conduct climate vulnerability assessments of the provincial forest, including tree health and wildfire risk.
  - Adjust all relevant forest management and wildfire management plans to incorporate the knowledge gained through assessments of vulnerability.
  - Work with industry and academia to advance tree improvement programs in Alberta to support adaptation and future fibre supply needs.
  - Expand forest monitoring and evaluation procedures to allow for additional responses that may be required in relation to the specified mitigation and adaptation actions.
  - Work closely with industry to support the growth of the bioeconomy that could contribute negative emissions.
  - Advocate for the use of low-carbon building materials and support the industry to improve market access and increase the use of wood products worldwide.

Heavy industry

Alberta's heavy industrial sector includes petrochemicals, cement, fertilizer, steel, pulp and paper, chemical, and the minerals and metals sectors, which accounted for 5.9 per cent of total employment in Alberta in 2020.

Many facilities in the sector in Alberta are emissions-intensive and trade-exposed (EITE). Such facilities typically face higher compliance costs to reduce emissions and may be less able to manage those costs because of global market price setting.

With the rising global demand for low-carbon manufacturing processes and ESG objectives, industrial operators are scouring the globe for responsible and affordable development opportunities. Continued attraction of investment in heavy industry in Alberta depends on feasible and competitive lower-carbon projects.

It is important to recognize EITEs and design climate policies that protect their competitiveness. Otherwise, domestic production would shift to other jurisdictions with lesser climate polices, leaking carbon and increasing global emissions.

Alberta's industrial carbon pricing and emissions trading system is designed to address competitiveness of EITEs.

What we have already achieved

- Alberta's Sector-specific Industrial Energy Efficiency (SIEE) Grant Program offers funding for energy efficiency projects in Alberta's EITE heavy industry facilities. SIEE supports technology and equipment upgrades to reduce emissions, increase competitiveness, lower carbon compliance costs and improve energy efficiency.
  - In 2019, $41 million in funds were allocated to six projects in the chemical, metal, minerals, fertilizer and forestry sectors. Projects are nearing completion in 2023 and are expected to achieve 3.7 Mt of reductions by 2030.
- Partnering with the International CCS Knowledge Centre, Lehigh Hanson Materials Limited completed a feasibility study of a large-scale CCS project at its Edmonton cement facility. The feasibility study had a budget of $3 million, made possible in part through $1.4 million in funding from Emissions Reduction Alberta. The feasibility study assisted Lehigh in determining the economic viability of a potential CCS retrofit project capturing up to 780,000 tonnes per year. The study found that amine-based post-combustion technology could capture up to 95 per cent of the CO_2 from both the flue gas emitted from the cement plant and from the boiler required to provide energy for the carbon capture process. If this technology reaches commercial deployment, it could accelerate the adoption of CCS technology in the cement industry globally.
- Proving that carbon capture can be applied to cement production supports the drive to create low-carbon footprint cement products that serve as sustainable building materials. The positive results of this study are pivotal for the cement sector, as the demand for cement is expected to increase by 12 to 23 per cent globally by 2050.

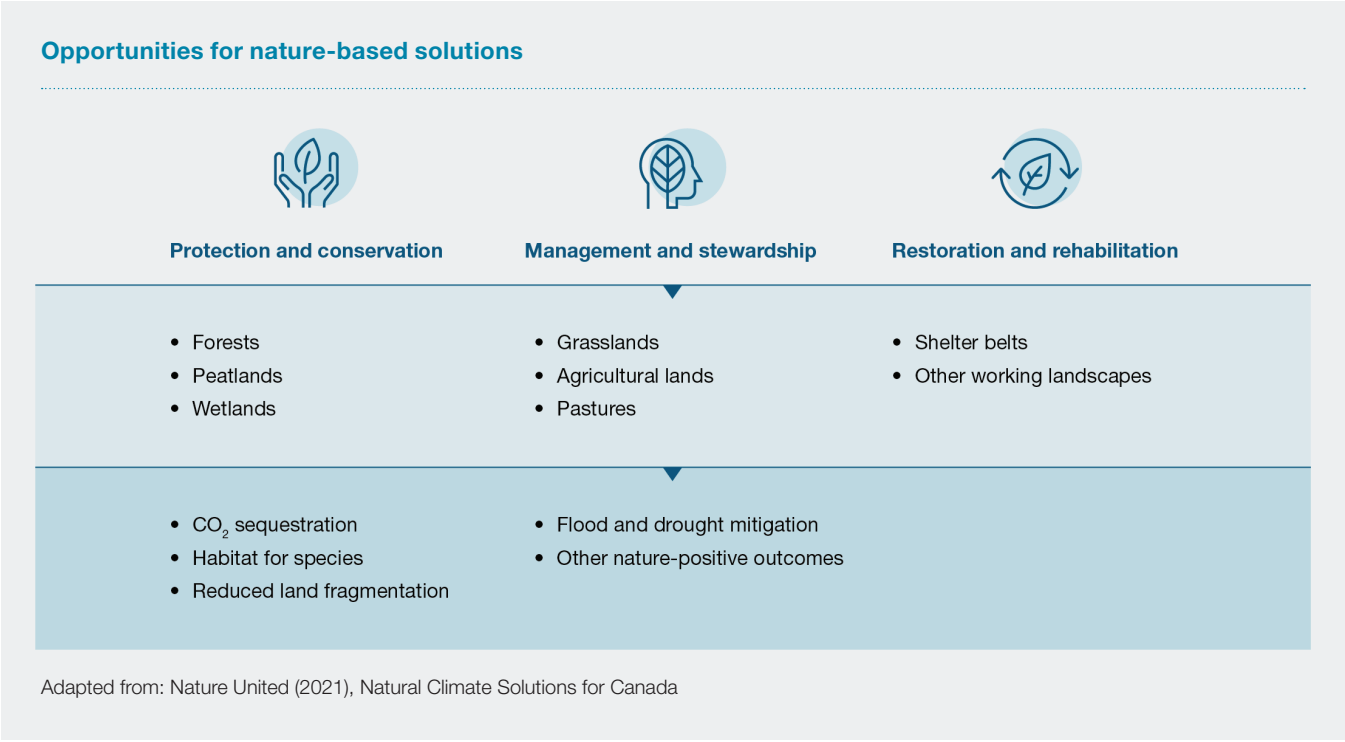
Ongoing actions and results

- Alberta's development of CCUS hubs throughout the province provides the opportunity for sectors like pulp and paper, mining, fertilizer and petrochemicals to drastically reduce industrial process emissions or even achieve carbon neutrality. Alberta's leadership in developing sequestration hubs will ensure that Alberta will be a global leader in CCUS.
- Located just northeast of Edmonton, Alberta's Industrial Heartland is a globally significant, 582 square kilometre industrial cluster. It is Canada's largest hydrocarbon-processing region, with 43 per cent of the nation's basic chemical manufacturing. The Heartland is becoming one of the world's most attractive locations for chemical and petrochemical investment, and a number of companies have publicly stated interest in building CCS networks there. Currently, it is already home to the Alberta Carbon Trunk Line, with the main supplier of captured carbon being the North West Redwater Sturgeon Refinery. Hydrogen is a key part of the Heartland's low-emissions innovation strategy, with an expectation of multi-billions of dollars of investment underpinned by the region's low-cost feedstock and carbon capture capability.

Alberta's Industrial Heartland is supported by best-in-class regulatory frameworks for investment and environmental objectives. Alberta's **Designated Industrial Zone pilot project** supports the province's commitment to work with municipalities and industries efficiently across the life cycle of approvals. It will optimize industrial cluster infrastructure for access to processed water, topsoil management and electricity transmission, all to achieve high environmental objectives. This effort is supporting current and prospective industries to invest in clean technologies, diversification and expansion.

What's next

- Alberta will continue to establish a range of policy measures and supports to anticipate growth, remove barriers and attract investment in low and non-emitting technologies for Alberta's existing and new heavy industries.
- Alberta will align reduction opportunities in Alberta's heavy industry sectors with strategic goals of other related sectors described in this plan, including the TIER regulatory system, clean technology, hydrogen and CCUS.



Adapted from: Nature United (2021), Natural Climate Solutions for Canada

Land and nature-based solutions

Natural and managed landscapes have the capacity to store significant carbon, thereby reducing the level of GHGs in our atmosphere while protecting our natural systems and landscapes, as well as increasing resilience to a changing climate. In Alberta, there is a significant opportunity to leverage the natural capacity of our grasslands, peatlands, forests, wetlands and riparian areas.

Nature-based solutions include a range of approaches to protect, manage and restore ecosystems to meet societal needs and build long-term environmental and economic resilience. Along with playing a critical role in addressing biodiversity loss, food security and resilient economies, nature-based solutions also offer opportunities to mitigate climate change by either increasing a natural system's capacity to sequester carbon or avoiding emissions from lands that would release carbon due to a land-use change.

Nature-based solutions can provide up to one-third of the global mitigation needs. Multiple landscapes across the province, such as protected areas, working landscapes and private lands can play a role. A recent study[13] found that Alberta has the potential for approximately 10 to 20 Mt per year of avoided emissions or increased sequestration between 2030 and 2050.

[13] Drever et al. (2021) Natural climate solutions for Canada. Science Advances 7 (23), eabd6034. DOI: 10.1126/sciadv.abd6034

Nature-based solutions provide multiple benefits. They help to:

- Store and capture carbon, mitigate the impacts of climate change, build resilience and improve water quality and provide critical habitat.
- Leverage nature and healthy ecosystems as tools to simultaneously deal with climate change, disaster risk, food and water security, biodiversity loss and human health, and can underpin sustainable economic development.
- Deliver multiple benefits including ecosystem health in forests, agricultural lands, and wetlands, as well as climate mitigation.

What we have already achieved

- Alberta has a world-class environmental management system that provides opportunities for nature-based solutions. The ongoing stewardship of the environment and natural resources is the foundation of Alberta's approach to these solutions, and Alberta is committed to taking a holistic approach to ensure they are not at the expense of other environmental outcomes.
- Public-private partnerships and the participation of rural communities and Indigenous people are essential to the success of nature-based solutions. Alberta's Land Stewardship Fund invests in maintaining large tracts of native landscapes, connecting corridors for biodiversity, and sustaining pockets of native habitats within fragmented landscapes and the associated societal and economic benefits therein.
  - Since 2011, the program has provided about $89 million to support conservation on 177,200 acres of private lands. Alberta promotes stewardship through numerous other initiatives including rangeland management, the Wetlands Replacement Program, and the Watershed Resiliency Program.
- Alberta has invested millions of dollars, and intends to invest $100 million or more in the next decade, in efforts to reduce fragmentation of the boreal forest, and will continue to support our land stewardship and wetland restoration programs.

What's next

- Alberta will develop a nature-based solutions policy framework that will include various tools to support conserving biodiversity, adaptive capacity and other ecosystem and cultural benefits as well as climate mitigation and resilience.
  - Alberta will assess the opportunities that markets can bring to landowners, communities and Indigenous people and engage the financial sector to invest in nature-based solutions.
  - Alberta will continue to remove regulatory, legislative and policy roadblocks and explore tools that can support land stewardship that provides public goods and services to Albertans.
  - Alberta will continue to look for opportunities to support these objectives over the coming years, working with partners, including industry, landowners and Indigenous communities.
- Alberta will continue its efforts on land-use planning to provide for long-term resilient ecosystems, communities, and economies, including nature-based solutions.
- Alberta is working with the livestock industry to develop a policy for grazing leases on public rangeland. This framework will outline the benefits of sustainable grazing management and facilitate the use of tools to support stewardship investments that recognize the value of ecosystems.
- Alberta is developing a strategy to provide clarity on the priorities for conservation outcomes, including establishment of new protected areas and consideration of working landscapes that contribute to conservation goals. Establishing these areas supports Indigenous values, tourism opportunities, and conservation objectives, and is aligned with Alberta's economic future.

PART SIX

Part 6: Other Alberta initiatives supporting environmental outcomes

Access to new global financial capital

Climate-focused finance continues to grow and create a unique opportunity for Alberta. Canada's five largest banks have collectively committed to offer $1.6 trillion to low-carbon, climate-related and energy transition opportunities by 2030. A growing number of corporations, financial institutions and institutional investors are making sustainable financial pledges.

Commitments to green/sustainable capital from Canada's largest banks

Bank	Amount ($ billion CAD)	Scope	Timeline
BMO	300	Sustainable	2025
CIBC	300	Sustainable	2030
RBC	500	Sustainable	2025
Scotia	350	Climate related	2030
TD	100	Low Carbon	2030
Total	1,550 (1.55 trillion)		

Source: Bank websites accessed February 8, 2023

Also, the Glasgow Financial Alliance for Net Zero (GFANZ) announced in November 2021 that the total assets of financial sector institutions with commitments to carbon neutrality now exceed $130 trillion. Financial institutions are preparing themselves to support clients with credible transition plans, and to allocate scarce capital between clients with significant projects or financing needs.

Investors and issuers are becoming more focused on corporate disclosure of transition pathways, which demonstrate the credibility of their net zero targets. The Office of the Superintendent of Financial Institution's B-15[14] makes it clear that financial institutions are expected to understand climate-related financial risks, show them in their balance sheet, and communicate to their stakeholders their strategies to manage them.

In recent years several taxonomies, definitions, principles and disclosure frameworks have been developed that define and govern financial market products to support the climate transition. Notably, several jurisdictions[15] have started to create official definitions of sustainable finance, including the European Union, China, Japan, France and the Netherlands among others. These include official definitions for green loans, green bonds and transition finance.

[14] Climate Risk Management (osfi-bsif.gc.ca)

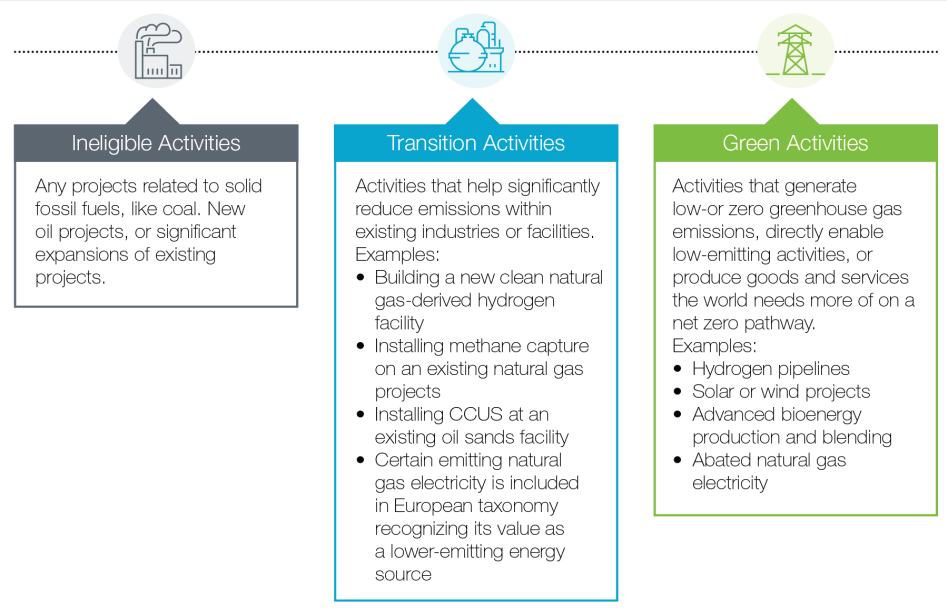
[15] Financial-Markets-and Climate Transition (oecd.org)

Canada is in the process of developing its own taxonomy,[16] a system of classification for these financial instruments. It is crucial for a resource-intensive province such as Alberta to participate in these discussions, among other reasons, to advocate for natural gas to be classified as a transition fuel. As a resource-based economy, Alberta must develop a coherent plan in tandem with the taxonomy with the goal of receiving an equitable distribution of carbon permits from the importing nation. Canada's carbon budget, particularly on Scope 3 emissions as defined by the U.S. Environmental Protection Agency, must not be unfairly penalized.

Alberta Environment and Protected Areas, jointly with Treasury Board and Finance, is considering creating an advisory group on sustainable finance to provide recommendations on Canadian taxonomy and the investment framework needed to ensure the right checks and balances are in place and to support innovation in the province.

Irrespective of the development of taxonomies, the finance sector is focused on corporate transition plans. Debt capital markets activity related to transition finance may not necessarily be formally termed transition bonds,[17] however this is a new and growing financial concept.

Sustainable finance taxonomy - example



[16] Taxonomy Roadmap Report: Advice and Recommendations (canada.ca)

[17] The global and Canadian sustainable finance market has advanced rapidly over the past decade. The use of sustainable finance (also called ESG labelled products) can complement traditional financing tools by dedicating provincial funds to specific types of environmental and social opportunities. This is achieved through the dedicated "use of proceeds" from a range of sustainability-labelled bonds, outlined below:

- Green Bonds: Enable capital raising and investment for new and existing projects with environmental benefits (example projects: renewable energy, clean transportation, energy efficiency and green buildings).
- Social Bonds: Enable capital raising and investment for new and existing projects with positive social outcomes (example projects: affordable basic infrastructure, access to essential services such as healthcare and education and creating economic resilience through programs that support the socio-economic development of Indigenous Peoples, or excluded and/or marginalized populations and communities).
- Sustainability Bonds: Enable capital raising and investment where the proceeds will be exclusively applied to finance or re-finance a combination of both green and social projects as outlined above.
- Transition Bonds: Enable capital raising and investment for projects that are making a substantial contribution to reducing global emissions by 2030 and reaching net zero by 2050. (example projects: decarbonizing emissions intensive activities, fuel switching from a high-emitting fuel source to a lower-emitting fuel source).

Alberta, as part of its own comprehensive strategy to meet its carbon-neutral goal, will require large-scale financial resources, for instance, to diversify its economy and develop new and emerging sources of energy and technologies such as hydrogen and CCUS.

This is an opportunity that Alberta cannot miss – to lower emissions to benefit the environment and to gain investment and create jobs. Alberta already is an attractive and competitive jurisdiction for investors. It can build on this foundation by demonstrating the credibility of its own carbon-neutral pathway through disclosure of Alberta's priority transition projects. Alberta will be well-placed to demonstrate its thought leadership and commitment to action, vital criteria for many investors, partners and other stakeholders in Canada and beyond.

Albertans and Alberta businesses continue to benefit from Alberta's low tax environment. With low personal income tax, low fuel tax and no sales tax or health premium charges. Albertans generally pay lower overall taxes than residents of any other province. Alberta's competitive corporate tax regime continues to encourage new investment and create jobs for Albertans. The Job Creation Tax Cut and continued efforts to reduce red tape are making Alberta one of the most competitive business environments in North America. At eight per cent, Alberta's general corporate income tax rate is 30 per cent lower than the next-lowest province, and Alberta's combined federal-provincial general corporate tax rate is lower than the combined federal-state rate of 44 U.S. jurisdictions. Alberta's corporate tax advantage includes no payroll tax and no capital tax.

Future-ready skilled workforce

Attracting investment to new and emerging lower-emitting industries rests not just on the large-scale mobilization of financial capital and historic investments in infrastructure, but also on human capital. This includes highly-skilled tradespeople and science, engineering, technology and math workers. The designated trades will also be a core part of the workforce needed to enable emissions reductions technologies and projects.

Fortunately, many Albertans already possess the skills and expertise required to meet the demands of low-emission industries. Evolution of trades programming for emissions reduction technologies will be important to ensure that Alberta has the skilled workforce needed as our economy attracts new investments. As announced in Budget 2022, Alberta is investing more than $600 million over three years in the Alberta at Work program, which is a collection of strategic investments to help Albertans develop new skills and grow their careers.

Creating new and exciting career opportunities for Alberta's youth in emerging energy, critical minerals and low-emitting technologies is critical. Alberta will work collaboratively with employers, industry associations and our post-secondary community to ensure that the skills being developed will meet the needs of the economy.

Environmental, social and governance (ESG)

Alberta established an ESG Secretariat in 2021 to serve as a strategic and coordinating body for all ESG related activities across government. It was the first of its kind by any province. The ESG Secretariat has a mandate to demonstrate Alberta's world-class ESG credentials in order to gain and maintain the confidence of investors and to ensure that jobs in Alberta are created and defended.

Alberta developed a Jurisdictional ESG Framework[18] to identify areas of performance that are relevant to the province. The categories in the framework were informed by, and where relevant, aligned to, the UN Sustainable Development Goals, Global Reporting Initiative, Sustainable Accounting Standards Board, and MSCI and S&P Global ESG ratings. Alberta uses the Jurisdictional ESG Framework to map the government's policies and programs that enable strong ESG performance across all ministries, industries and businesses, and to communicate commitment to and ambition for ESG excellence. The categories of the jurisdictional ESG framework are summarized below.

Alberta is positioning itself to be a global ESG leader for clean, secure and ethically sourced energy. Some examples of strategic priorities that are supporting this aspiration are:

- Hydrogen: develop and deploy a hydrogen economy that leverages our competitive advantages to build clean energy solutions and develop export capacity.
- CCUS: leverage our geological advantages to enable large-scale emissions mitigation through CCUS.
- Natural Gas and LNG: ensure Alberta's natural gas has access to Asian and European markets and displaces coal around the world.
- Diversified Electricity: enable diversified and renewable electricity generation through our open, 24-hour, free-market grid.
- New Markets for Bitumen: develop new products from our energy resources that capture the non-combustible chemical value of bitumen.

Environmental	Social	Governance
Emissions, Air Quality and Climate Risk	Indigenous Partnerships, Participation and Reconciliation	Energy Security
Water Resources	Social Mobility, Equal Opportunities and Human Rights	Financial Disclosure, Stewardship and Future Capacity
Biodiversity, Energy Resources, Natural Capital Protection, Remediation and Reclamation	Demographics, Diversity, Inclusion and Community	Economic Stability, Sustainability and Growth
Effluent and Waste, Recycling and Redirection	Civic and Social Services	Innovation, Technology Export and Adoption
		Institutional Governance, Laws and Regulations, Compliance, Ethics and Transparency

[18] Government of Alberta, Jurisdictional ESG Framework, September 2022, https://open.alberta.ca/publications/jurisdictional-esg-framework.

Adaptation and resilience to a changing climate

Alberta works with partners to understand and monitor the changing climate and to provide information to those looking to build resilience across the province, including:

- ClimateWest, a central hub for climate services in the Prairies. It provides regionally relevant climate information for communities, businesses, non-profits and governments to use in their planning and decision-making.
- The Indigenous Wisdom Advisory Panel, an independent panel reporting to the Chief Scientist and the Minister of Environment and Protected Areas, provides advice and guidance about the incorporation of traditional ecological knowledge and the environmental science program. Panel member Chief Willie Littlechild spoke at a United Nations meeting in 2018-2019, acknowledging the Indigenous Wisdom Advisory Panel as an exemplary model that other jurisdictions should consider for respectful inclusion of Indigenous knowledge in environmental science and monitoring programs. Guided by the advice of the Indigenous Wisdom Advisory Panel, the Indigenous Climate Change Observation Network supports shared stewardship of Alberta natural resources by enabling Alberta's Indigenous knowledge holders and scientists to co-produce the best available knowledge about climate change.
- Alberta's Office of the Chief Scientist provides the public with information about trends in the condition of Alberta's environment.

In collaboration with municipalities, Indigenous communities and other partners, Alberta is also working to reduce the risks of flood, drought, wildfire and extreme weather. Several programs help to manage and reduce the threat of wildfire, like the FireSmart Program, which helps communities and residents reduce the likelihood of uncontrollable wildfires, enhance public safety and improve protection of at-risk communities. A new wildfire app and web-based status map provide information about nearby wildfires, fire bans, and fire danger ratings so Albertans are aware of risks.

There are also programs to reduce flood risks, like the Watershed Resiliency and Restoration Program, which supports projects increasing the natural ability of watersheds to reduce the intensity, magnitude, duration and effects of flooding and drought through watershed mitigation measures.

Alberta also has disaster resilience guidelines in the Alberta Emergency Plan that can enhance resilience to a range of hazards, including flooding and wildfire.

Alberta continues to integrate climate adaptation considerations into government operations, policies and programs, and decision-making.

Alberta continues to update its **flood mapping**, now covering 1,500 km of rivers and more than 60 municipalities and First Nations communities across the province.

Budget 2023 contained several important **new flood protection investments** for Alberta communities. The budget committed $744 million to complete construction of the Springbank Off-Stream Reservoir to protect against floods and droughts along the Elbow River in Calgary and other downstream communities. It also committed $39.5 million for three flood mitigation and water management capital grants in flood-prone communities around the province, including the Town of Drumheller, Foothills County Lower Highwood and the Mud Lake Basin, northwest of Fort Macleod.

Conservation, restoration and land management

Conservation, restoration and land management are critical to addressing climate change and creating resilient ecosystems, economies and communities.

Alberta has a well-established network of protected and conserved areas that represents and continues to work towards increasing the variety of landscapes. Currently, over 15 per cent of Alberta's land base is protected and conserved, providing critical habitat to over 60,000 species.

Crown land, which covers approximately 60 per cent of the province and sustains Alberta's abundance of resources and biodiversity, is managed to support conservation, recreation, economic development and the continued exercise of Treaty rights. For example, the province and Indigenous communities have created cooperative management arrangements for long-term land sustainability and protection, including protecting the Ronald Lake bison herd, management of Writing-on-Stone Provincial Park, and others.

Restoration of critical habitat has many environmental benefits and supports economic activity in rural areas. For example, the Caribou Habitat Recovery Program supports the restoration and recovery of legacy seismic lines within Alberta caribou ranges. It re-establishes tree cover and enhances carbon storage. As well, it reduces forest fragmentation and recreational access that often leads to reduced habitat and increased risk of wildfire. Through restoration programming, Alberta has already planted over 1.5 million trees.

Alberta has the **world's largest contiguous protected boreal forest in the world**. Together, Alberta's parks and protected areas, along with the federal Wood Buffalo National Park, comprise over 7.1 million hectares of protected area in northeast Alberta. In 2022, a collaboration between Alberta's government, Indigenous communities, and the federal government enabled the expansion of Kitaskino Nuwenëné Wildland Provincial Park, adding more than 375,000 acres to the largest continuous area of boreal forest – maintaining habitats for species at risk, such as woodland caribou and wood bison.

Alberta has found innovative ways to advance Indigenous-led conservation and restoration initiatives. This includes completion of the recently established **Moose Lake Access Management Plan**, developed through a collaborative approach with Fort McKay First Nation to establish resource development disturbance limits that support responsible resource development, resilient ecosystems, and the exercise of Treaty rights. The plan includes support for community-based monitoring, the intent to develop reclamation criteria with a traditional-use focus, and Indigenous-led restoration of existing legacy footprint.

Additionally, Alberta is advancing **cooperative management** in a number of wildland parks with Indigenous groups to develop parks-specific management plans that focus on conservation and ongoing support for traditional uses.

Water management

Our quality of life is afforded by abundant water resources: Alberta's Rocky Mountains form the headwaters that supply much of Canada with fresh water. Healthy, secure and sustainable water supplies support our communities, environment and economy.

Alberta's long-standing Water for Life Strategy guides Government of Alberta water policy. The strategy was the first of its kind in North America and remains one of the most comprehensive. It safeguards the province's water resources to achieve our goals of:

- safe, secure drinking water supply
- healthy aquatic ecosystems
- reliable, quality water supplies for a sustainable economy

These goals are achieved through knowledge and research, partnerships, and water conservation.

Watershed management partnerships: As we all share the responsibility to manage and protect water resources, Alberta has established and supports:

- The provincial Alberta Water Council – a collaborative partnership that provides leadership, expertise and sector knowledge to help governments, Indigenous Peoples, industry and non-governmental organizations to advance the outcomes of *Water for Life*.
- Eleven watershed planning and advisory councils covering all major basins. They are independent, non-profit organizations that are designated by the Alberta government to report on the health of our watersheds, lead collaborative planning, and facilitate education and stewardship activities.
- Numerous local watershed stewardship groups that take community-level action to safeguard our water sources.

PART SEVEN

Part 7: Accountability, collaboration and reporting

Alberta remains committed to outcomes-based approaches that are complemented by transparency in reporting progress and impacts.

Alberta will continue to:

- Work collaboratively with partners – including ENGOs, industry, Indigenous organizations, municipalities, labour groups and others – to design effective policy and programs to support implementation of the Emissions Reduction and Energy Development Plan.
- Establish a youth advisory group to provide Environment and Protected Areas with young people's perspectives on addressing environmental issues.
- Establish policies and programs that are evidence-based, including understanding of the environmental, social and economic impacts of policy choices.
- Publish reports documenting the progress and outcomes of the actions taken as part of the Emissions Reduction and Energy Development Plan.

Alberta is also committed to modernizing its regulatory process to achieve higher levels of efficiency without compromising environmental and human health. Reducing red tape, such as duplicate processes and rules that do not add protections, will save time, money and resources while still protecting the environment, keeping Albertans safe and healthy, and upholding fiscal accountability.

Alberta will continue to engage with stakeholders when implementing the Emissions Reduction and Energy Development Plan to ensure effective policy and program development.

Alberta released the first climate strategy in Canada in 1998, with subsequent strategies released in 2002, 2008 and 2015. The Emissions Reduction and Energy Development Plan builds off these previous strategies and the results that have been achieved from these policies.

Alberta's approach remains founded on comprehensive policy and program frameworks to achieve ambitious yet achievable goals.

Emissions Reduction Targets	Status and Results
1995: Alberta government committed to reduce emissions from its operations by 14.1 per cent below 1990 emission levels within five years.	Surpassed our goal. By the end of 2000, the Alberta government had exceeded its target and reduced emissions by 22 per cent below 1990 levels.
2002: Albertans & Climate Change – Taking Action strategy included that by 2010, Alberta will cut emissions in the province relative to GDP by 22 per cent below 1990 levels and by 2020, cut emissions relative to GDP by 50 per cent below 1990 levels. 2003: The 2020 target was enshrined in the *Climate Change and Emissions Management Ac*t (known today as the *Emissions Reduction and Climate Resilience Act*).	Surpassed our goal. In 2003, Alberta exceeded these emissions intensity targets for 2010 and 2020, achieving a 57 per cent reduction from 1990 levels in 2010, and a 61 per cent reduction from 1990 levels in 2020.
2008: The Alberta Climate Strategy aimed to have emission levels at 260 Mt in 2020, representing a 50 Mt reduction from business as usual, with investments in energy efficiency and conservation, CCS and greening energy production.	Surpassed our goals. According to the latest National Inventory Report (2023), Alberta's emissions in 2020 were 254 Mt, achieved through various investments including uptake of CCUS, greening energy production with the coal-fired electricity emissions phase out, and reductions in oil and gas methane emissions.
2015: Alberta committed to capping oil sands emissions at 100 Mt per year.	Achieving our goal. Emissions have remained below the limit. Oil sands emissions counted towards the limit are approximately 70 Mt.
2015: Alberta committed to ending emissions from coal-fired electricity in 2030.	On track to surpass our goal. Alberta is expected to be off coal-fired electricity generation by the end of 2023, seven years ahead of our target.
2015: Alberta committed to 30 per cent renewable energy by 2030.	On track to meet or surpass our goal. Alberta has attracted over $2 billion of investment in utility-scale renewable projects since 2019 and is on a trajectory to reach the 30 per cent renewable target ahead of 2030.
2015: Alberta committed to reducing methane emissions from the oil and gas sector by 45 per cent below 2014 levels by 2025.	On track to meet or surpass our goal. By 2022, Alberta's conventional oil and gas sector had already reduced methane emissions by 45 per cent from 2014 levels.