

Alberta's Emerging Economy

A blueprint for job creation through 2030

Saeed Kaddoura

Binnu Jeyakumar, Benjamin Israel, Nikki Way, Morrigan Simpson-Marran

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Production management: Roberta Franchuk

Editor: Michelle Bartleman

Authors: Saeed Kaddoura, Binu Jeyakumar,
Benjamin Israel, Nikki Way, Morigan
Simpson-Marran

Design/Layout: Roberta Franchuk

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The Pembina Institute

219 19 Street NW

Calgary, AB

Canada T2N 2H9

Phone: 403-269-3344

About the Pembina Institute

The Pembina Institute is a national non-partisan think tank that advocates for strong, effective policies to support Canada’s clean energy transition. We employ multi-faceted and highly collaborative approaches to change. Producing credible, evidence-based research and analysis, we consult directly with organizations to design and implement clean energy solutions, and convene diverse sets of stakeholders to identify and move toward common solutions.

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Executive summary

Solar energy. Wind power. Electric vehicles. Methane reductions. Industrial energy efficiency. As Alberta's innovators and entrepreneurs adapt to a quickly changing world, the province is well-positioned to lead efforts to decarbonize for a more stable, healthier future.

A prolonged period of lower oil and gas prices followed by the global COVID-19 pandemic in early 2020 and the subsequent sharp drop in demand has led to major job losses in Alberta. As the province responds to international fluctuations in commodity prices, shifting consumer choices, new technologies, and international action on climate, uncertainty is the only certainty for traditional energy workers and their communities. These external pressures and developments, however, represent opportunities to diversify Alberta's economy, make it more robust and resilient, and unlock an untapped job market and economic development potential. New jobs in the low-carbon energy economy, and jobs that reduce carbon intensity and overall emissions in the oil and gas industry, represent a path to stable employment that is less sensitive to fluctuations in fossil fuel commodity prices.

This report calculates the jobs potential in the four key areas of Alberta's economy, which can contribute significantly to job creation while also directly reducing greenhouse gas emissions: renewable electricity; transit and electric vehicle infrastructure; energy efficiency in buildings and industry; and environmental cleanup and methane reduction in oil and gas.

While the province's solar and wind resources already attract national and local investments, a combination of environmental and economic drivers are shifting Alberta's electricity grid toward low-carbon, decentralized generation sources. As Alberta's growing cities and towns become more connected with provincial and federal funds channelled into increasing public transit options, and as municipalities explore passenger vehicle electrification, transit and charging infrastructure will become substantial contributors to emerging job growth. More-stringent building standards and demands for upgrades to existing structures will require new jobs that focus on designing, constructing and operating buildings more efficiently. Increasing the energy efficiency of processes will bring jobs that help industries maintain competitiveness and improve their environmental performance. While the oil and gas industry is one of

Alberta's largest employers, trends indicate continued challenges ahead. Jobs centred on decarbonizing our economy (like reducing methane emissions) and addressing liabilities (through well cleanups) represent a chance to retain existing job numbers and remain competitive.

Based on the latest market studies, development plans and growth projections over the next decade, this report examines the employment potential in these four areas in Alberta. It provides a blueprint for what job opportunities could look like as Alberta's economy evolves over the next decade.¹

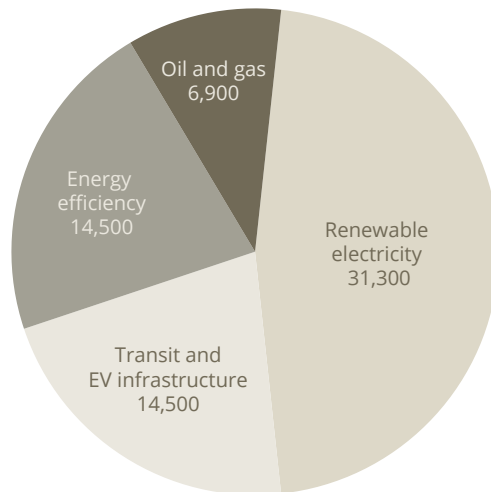
Our analysis found that 67,200 jobs can be created over the next decade — equal to 67% of the total workforce of the mining, and oil and gas extraction industry in 2019.

Our analysis of the four key areas of Alberta's economy found that 67,200 jobs can be created over the next decade. This represents a significant portion of Alberta's labour market – it is equal to 67% of the total workforce of the mining, and oil and gas extraction industry in 2019.² These jobs – and others in emerging sectors – show the significant potential for stable, prosperous jobs for Albertans in a more diversified economy.

In this report we focus on established areas of this emerging economy with a high potential for job creation over the next decade, which could be realized immediately given the right investment and policy environment. We did not consider developing industries where technologies or processes are not yet widely deployed commercially, such as carbon capture and storage, nature-based solutions, and hydrogen production.

¹ The job numbers reported refer to annual full-time equivalent (FTE) jobs that can come online by 2030 given the right policy environment and investments.

² The number of jobs in the oil and gas sector has declined between 2019 and the publishing of this report due to record low oil prices and the COVID 19 pandemic. 2019 numbers are used here as a reference point as the job numbers during the pandemic are under flux.



Total potential jobs =
67,200
through 2030



Potential for new jobs under areas of the decarbonizing economy
in Alberta through 2030

Renewable electricity

Number of full-time positions by 2030: **9,300 – 31,300**

Alberta's electricity sector has been transitioning from one dominated by coal-fired generation to one that is more decentralized and more diverse in terms of fuel source, with significant growth in renewable energy. Driven by climate policy, the negative health impacts of coal pollution, and the increasingly strong economics of renewables, coal plants are being retired. More solar- and wind-powered generation capacity is coming online. The development of renewables in Alberta could create up to 31,300 new jobs — and potentially even more if coupled with increasing policy certainty — to significantly offset the 2,890 jobs lost from phasing out coal.

Transit and electric vehicle infrastructure

Number of full-time positions by 2030: **14,500**

Investing in low-carbon transportation options will not only reduce greenhouse gas emissions, it will also improve mobility and accessibility within cities, allowing workers to get to their jobs in an affordable manner. New jobs can be found in construction, operation and maintenance of transit projects over the next decade (6,700 jobs for Calgary and Edmonton light rail transit and 1,300 jobs for other transit projects). Meanwhile, as electric vehicles become more popular, up to 6,500 jobs will also be created to install and maintain charging infrastructure.

Energy efficiency in buildings and industry

Number of full-time positions by 2030: **14,500**

As more energy efficiency measures are adopted by individuals, businesses, and industry, new jobs will be created in the building trades related to residential (1,700) and commercial (2,000) energy efficiency.

Improving electrical and heating efficiencies has the potential to create 8,500 jobs in the oil and gas industry, and 2,300 jobs in industries such as chemical, pulp and paper, manufacturing, and agriculture.

Environmental cleanup and methane reduction in the oil and gas industry

Number of full-time positions by 2030: **6,900**

New jobs in the oil and gas industry can offset some of the jobs that have been lost and offer potential for both climate change mitigation and increased competitiveness as business practices shift within Alberta's most energy-intensive industry. There are substantial opportunities in the cleanup of past extraction activities (6,100) and methane emissions reduction (800).

Policies that enable emerging economy growth

Effective government policies are needed to ensure that job and economic growth in the emerging economy are maximized. The following existing and recommended policies support this vision for a thriving, more diversified economy in Alberta:

- **Pricing pollution** – Pricing pollution encourages investment in low-carbon innovation. Several economic diversification programs are funded through the distribution of revenues earned from pricing pollution, including carbon pricing.
- **Renewable energy policy certainty** – A regulatory framework and market that allows renewable developers, energy efficiency specialists, and storage providers to monetize their contributions to the grid will help to create policy certainty for renewable investments in the province, and can create opportunities in construction, operation and maintenance, and manufacturing.

- **Residential, commercial and community renewable energy programs** – Policy-driven programs that provide long-term revenue certainty or rebates for solar installations increase local participation, which generates jobs, while also contributing to energy independence.
- **Coal phase-out**– The governments of Alberta and Canada have committed to phasing out coal by 2030. This commitment provides workers, communities and the industry long term certainty for planning for a transition away from coal.
- **Investment in transit and electric vehicles** – Government spending on public transit and electric vehicle charging infrastructure, as well as national regulations to increase the sale of electric vehicles, creates jobs. In addition, as population and employment grows in mid- to large-size municipalities in Alberta, transit investments also improve connectivity between communities, resulting in better access to more job opportunities for residents.
- **Energy efficiency standards and funding** – Creating energy efficiency targets, more efficient building standards, and rebate programs supporting retrofits all encourage investment in energy efficiency, while creating comfortable living and working spaces, and generating jobs. Additionally, financing programs that make it easier to invest in longer-term efficiency upgrades can in turn increase the demand for those upgrade services, creating additional jobs.
- **Decommissioning and reclamation** – Policies that ensure funds are available to undertake cleanup of past fossil fuel extraction activities, and that this is completed in a timely manner, could play a significant role in creating job opportunities in the oil and gas sector.
- **Methane regulations** – Regulatory action to meet or exceed Alberta’s target of reducing methane emissions by 45% below 2012 levels by 2025 will improve the sector’s carbon competitiveness, incentivize businesses toward technological innovation, and create associated jobs.
- **Just transition** – Policies and programs are needed to support workers and communities impacted by industries that are vulnerable to an energy transition, to provide reskilling opportunities to enable workers to transition to the emerging jobs, and to ensure that the jobs created are well paid and protect workers’ rights.

1. Introduction

Alberta's economy is changing.

The ever-fluctuating economics of energy, shifting consumer choices, new emerging technologies and increasing action on climate mean Alberta's job creators must also adapt and evolve. This was the case even before the massive economic downturn that was triggered by the COVID-19 pandemic in early 2020. While not without its challenges, these changes present an opportunity to diversify the economy, making it more robust and less susceptible to fluctuation, while unlocking untapped job and economic development potential.

This emerging economy also presents opportunities for more predictable economic development and the creation of high-quality jobs for new and transitioning workers. The costs of renewable electricity are dropping, making Alberta's abundant wind and solar resources more attractive. Electric vehicle and public transit infrastructure create local jobs, and give residents greater access to other employment, all while reducing transportation emissions. Energy efficiency investments in the buildings sector lead to savings for families and businesses, while building specialized knowledge and services. The decommissioning and environmental reclamation of inactive oil and gas facilities can keep jobs in the energy sector. Jobs to implement advances in methane management reduce climate impacts while signalling to investors that Canada's oil and gas industry is taking steps to decarbonize its products.

In this report we look at the jobs potential of different areas in this emerging economy, based on the latest market studies, development plans and growth projections through to 2030. Our analysis focuses mainly on identifying direct jobs, but we have also included the potential for indirect jobs created in supporting sectors when data is available or reported separately from direct jobs. This report calculates the job potential of the emerging economy in full-time equivalents (FTE).³

³ See Appendix A.1 for job type definitions and conversions.

2. Key areas in the emerging economy

We have identified four key areas of Alberta's economy as the largest potential contributors to job growth that will help the province improve environmental performance: renewable electricity; transit and electric vehicle infrastructure; energy efficiency in buildings and industry; and environmental cleanup and methane reduction in oil and gas.

Based on the latest market studies, development plans and growth projections over the next decade, this section provides a blueprint for job opportunities as Alberta's economy evolves. In this report we focus on established areas of this emerging economy with a high potential for job creation over the next decade, which could be realized immediately given the right investment and policy environment. We did not consider developing industries where technologies or processes are not yet commercially deployable, such as carbon capture and storage, nature-based solutions, and hydrogen production.

2.1 Renewable electricity

Alberta's electricity sector has been transitioning from one that is dominated by coal-fired generation to one that is more diversified and decentralized, with significant growth in the use of renewable sources. Driven by the weak economics and negative health impacts of coal pollution, combined with low natural gas prices and the decreasing costs of renewables, coal plants are being decommissioned as other more economic generation sources come online.

When comparing the lifetime output from renewable energy sources against that generated at gas plants, it may come as a surprise for many to learn that renewable energy is cheaper. In fact a portfolio of clean energy options including renewables, storage, energy efficiency and demand side response can provide the same services as a new gas plant while costing \$9 to \$24 less per megawatt hour than energy from new gas plants.⁴

⁴ Jan Gorski and Binu Jeyakumar, *Reliable, affordable: The economic case for scaling up clean energy portfolios* (Pembina Institute, 2019). <https://www.pembina.org/pub/reliable-affordable-economic-case-scaling-clean-energy-portfolios>

It is important to note the role government plays in sending signals of policy certainty that encourage investments in renewables and increase the potential for employment growth in the electricity sector. Having a clear policy roadmap provides certainty to the industry and results in greater investments in construction, operation and maintenance, and manufacturing. A study by the Canadian Wind Energy Association (CANWEA) of Alberta's wind energy supply chain found that having a clear policy roadmap to 2030 would create more jobs in renewables by attracting wind tower and blade manufacturing, as well as component repairs and replacement.^{5, 6, 7}

In 2019, the Alberta government cancelled its Renewable Electricity Program (REP).⁸ This program had been extremely successful in procuring the lowest cost energy option for the province, and resulted in over 1,300 MW of wind power.⁹ The Alberta government also put the \$200 million Community Generation Program¹⁰ on hold until future notice.

⁵ Delphi Group, *Alberta Wind Energy Supply Chain Study* (2017), prepared for the Canadian Wind Energy Association, 17-19. <https://canwea.ca/wp-content/uploads/2017/09/Delphi-AB-Wind-Supply-Chain-Study-Final-Report.pdf>

⁶ National Energy Board, "Market Snapshot: Power generation from large solar farms in Ontario almost doubled in 2016," February 8, 2018. <https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/snpsht/2017/02-02lrgslrfrms-eng.html>

⁷ Considering the dominance of the foreign market in solar panel manufacturing, and the fact that 98% of Canada's installed solar generation is located in Ontario, it is unlikely that a significant provincial or national solar manufacturing industry will arise in Alberta by 2030.

⁸ Alberta Electric System Operator, "Renewable Electricity Program." <https://www.aeso.ca/market/renewable-electricity-program/>

⁹ Alberta Electric System Operator, "REP news and updates," December 17, 2018. <https://www.aeso.ca/market/renewable-electricity-program/rep-news-and-updates/>

¹⁰ Government of Alberta, "Putting power in the hands of communities," November 22, 2018. <https://www.alberta.ca/release.cfm?xID=620855BF8D8B3-9B90-88C9-FD9330F8A9406D44>

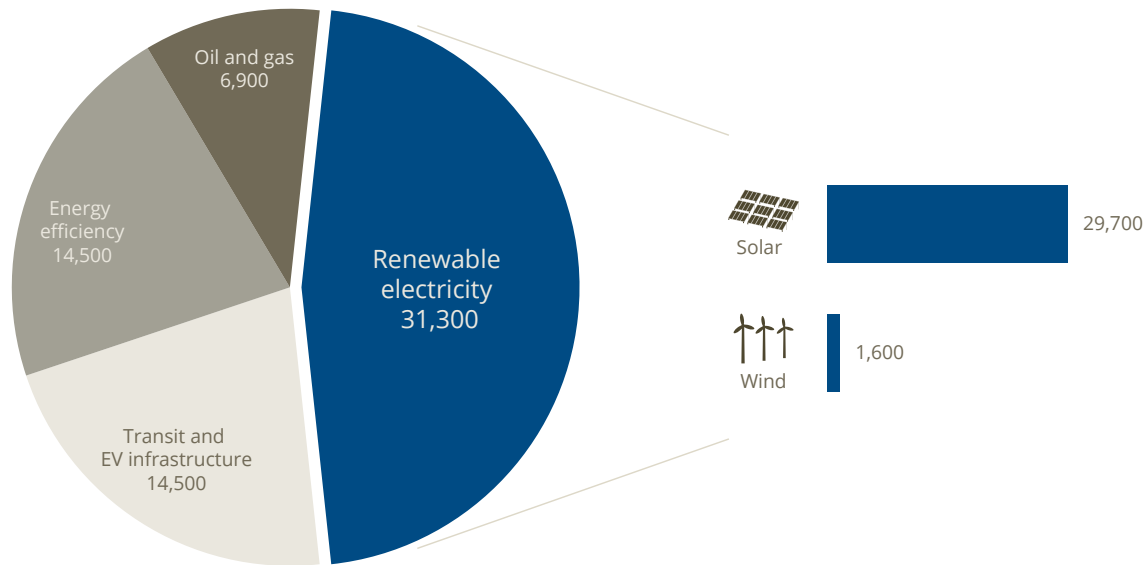


Figure 1. Jobs potential in renewable electricity

2.1.1 Renewable electricity generation

The Alberta Electric System Operator (AESO) is the operator and manager of Alberta's power grid. In 2019, it released a long-term outlook forecasting electricity demand and generation in the province to 2030 based on multiple energy demand scenarios.¹¹ This report uses two of these scenarios to estimate job creation from renewable energy projects constructed by 2030: one scenario of high investment in renewables, and one of diversification into sectors completely new to Alberta such as blockchain.¹²

Table 1 presents the job potential for each of these scenarios.

¹¹ Alberta Electric System Operator, *AESO 2019 Long-term Outlook* (2019).
<https://www.aeso.ca/grid/forecasting>

¹² These two scenarios were selected because they achieve Alberta's target of 30% renewable energy by 2030, while the high and low energy demand growth scenarios in the AESO outlook do not; the business-as-usual estimates for 2030 have already been exceeded.

Table 1. Job potential derived from the 2019 Long-Term Outlook scenarios

FTEs generated until 2030		
Generation Technology*	Alternate Renewable Policy Scenario	Diversification Scenario
Wind	3,600 (4,700)**	1,600 (2,100)
Solar	5,700	29,700
Total	9,300 (10,400)	31,300 (31,800)

* The long-term outlook does not forecast any new significant geothermal capacity coming online by 2030. There are 27 different technologies available to generate geothermal energy, but without policy clarity around geothermal energy's future in Alberta it will be difficult to grow this market by 2030. New hydropower generation capacity does not come online in Alberta until 2034, so the job creation potential in the sector before 2030 is negligible. Hydropower development can be slow because it is geographically limited and resource intensive, and projects typically have long lifespans.

** numbers in parentheses reflect jobs created in presence of a clear policy roadmap by 2030.

AESO's forecast for wind development could result in the creation of 1,600 to 4,700 direct jobs in construction, operation and maintenance, and manufacturing, with the alternate renewable policy scenario leading to the higher jobs estimate. New generation capacity under this scenario is weighted toward the lowest-cost renewable generation technology, which is currently wind power generation.

The forecast for solar development could create between 5,700 and 29,700 direct jobs in construction, and operation and maintenance, with the diversification scenario leading to the higher jobs estimate. This scenario assumes a significant drop in the cost structure of solar power and a higher energy storage penetration relative to other scenarios. Under both scenarios the job creation potential of solar development can significantly offset the 2,890 jobs lost from phasing out coal.¹³

It should be noted that growth in renewables has been faster and often exceeded deployment projections made by international energy agencies.¹⁴ As renewables continue to become more cost-effective than gas-fired generation, there will likely be an increase in uptake of renewable projects in the province — resulting in increased job creation opportunities.⁴ Changes to the existing regulatory framework and market that allows renewable developers, energy efficiency specialists, and storage providers to

¹³ Ian Hussey and Emma Jackson, *Alberta Coal Phase-out: A Just Transition?* (Parkland Institute, 2019), 5. https://www.parklandinstitute.ca/albertas_coal_phaseout

¹⁴ U.S. Energy Information Administration, "EIA forecasts renewables will be fastest growing source of electricity generation," January 18, 2019. <https://www.eia.gov/todayinenergy/detail.php?id=38053>

monetize their contributions provided to the grid — such as being compensated for providing flexibility or efficiency — will help to create policy certainty for renewable investments in the province, and can create opportunities in construction, operation and maintenance, and manufacturing.

2.1.2 Grid modernization

It is not only the mix of electricity generation sources on the grid that is changing. Alongside advances in technology, increasing demands from customers to manage their consumption, increasing adoption of EVs, and the growing desire for self-generation, will come a demand for a wide range of skilled workers in grid modernization, including cyber-security, customer support for service providers, and grid operation and management. No estimates of these job potentials were made for this report.

2.2 Transit and electric vehicle infrastructure

After the industrial sector, transportation in Alberta is the second largest energy-intensive sector and accounts for 12% of the greenhouse gas emissions in the province.¹⁵ Investing in alternative transportation solutions like public transit will improve mobility and accessibility within cities, allowing workers to get to jobs affordably and opening up other job opportunities in other areas, all while reducing transportation GHG emissions associated with personal vehicle travel. It can also improve mobility between cities, allowing workers to access additional jobs in other markets.

¹⁵ “Provincial and Territorial Energy Profiles – Alberta,” Figure 8.

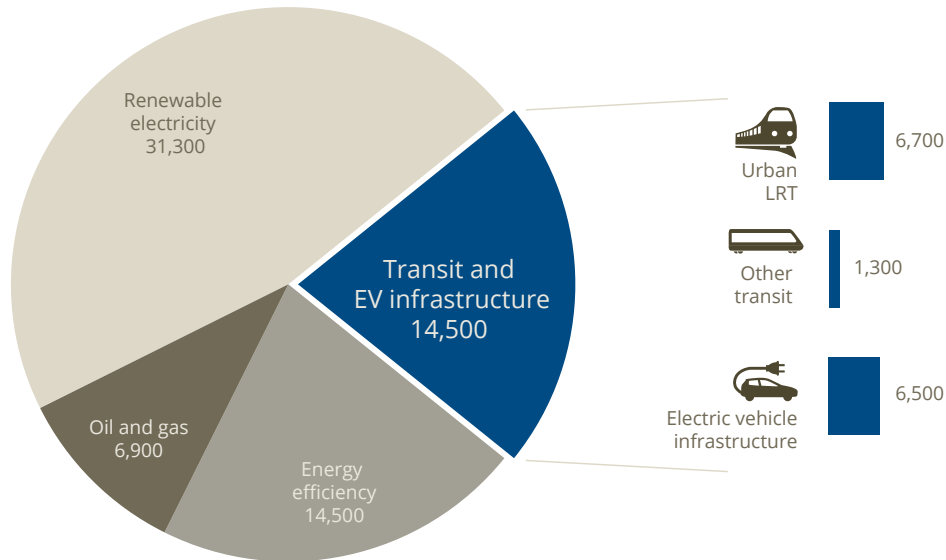


Figure 2. Jobs potential in transit and electric vehicle infrastructure

2.2.1 Urban LRT projects

Public transit remains an essential public good for Albertans during the COVID-19 pandemic and will be essential to its economic recovery. During this time, essential service workers rely on public transit to get to work, and many people still depend on transit to access basic needs such as medical care and food. As Alberta's population grows and cities become more dense, public demand for a wide range of affordable and low-carbon mobility options such as public transportation will be increasingly important to safely connect Albertans to their work and to each other.

The Government of Alberta has approved four major public transportation projects that will be significant job contributors in the coming decade. These projects will result in construction as well as operation and maintenance (O&M) jobs, as shown in Table 2. In addition, expansion of public transport will also result in greater employment opportunities for transit workers.

Table 2. Jobs created from major public transportation projects in Alberta by 2030

Project	Direct jobs		Total jobs (direct and indirect)*	FTE
	Construction	O&M		
Edmonton Valley Line West LRT ¹⁶	12,000	400	20,000	2,500
Edmonton Metro Line NW LRT ¹⁷	2,000	60	2,830	300
Edmonton Southeast Valley Line LRT ¹⁸	10,000	150	17,150	1,400
Calgary Green Line LRT ¹⁹	12,000	400	20,550	2,500
Total				6,700

* reported in job-years not FTE

2.2.2 Other public transit

While the approved LRT projects will contribute a significant number of jobs in the coming decade, there is still plenty of capacity in Alberta for public transit expansion. Census data from 2016 shows that public transit still has significant growth potential as Alberta's cities grow to match the size of large cities in other provinces. The proportion of workers commuting via public transit is 16% in Calgary and 11% in Edmonton, compared to 24% in Toronto and 20% in Vancouver.²⁰ Ridership, however, decreased in Calgary by 2% between 2011 and 2016, and plateaued in Edmonton at 11%,²¹ often an indication that adequate and convenient transit options aren't available.

¹⁶ Government of Alberta, "Alberta funds Edmonton Valley Line West," media release, November 1, 2018. <https://www.alberta.ca/release.cfm?xID=619261EB43F14-AA9B-AF5E-D7D0A00C87891D3C>

¹⁷ "Alberta funds Edmonton Valley Line West."

¹⁸ Government of Alberta, "Alberta invests in Edmonton LRT", media release, September 15, 2017. <https://www.alberta.ca/release.cfm?xID=486083AE6C446-A3FC-6222-8321F954FC8859DD>

¹⁹ Government of Alberta, "Province commits to the Calgary Green Line," media release, July 6, 2017. <https://www.alberta.ca/release.cfm?xID=47232F4AA59E8-BEF5-44F7-ABA0E76007A8AC33>

²⁰ Statistics Canada, *Journey to work : Key results from the 2016 Census* (2017), 9. <https://www150.statcan.gc.ca/n1/en/daily-quotidien/171129/dq171129c-eng.pdf?st=Q9onlXUX>

²¹ Statistics Canada, *National Household Survey: Commuting to work* (2011). https://www12.statcan.gc.ca/nhs-enm/2011/as-sa/99-012-x/99-012-x2011003_1-eng.pdf

In 2018, the Government of Alberta signed a bilateral agreement with the federal government under the *Investing in Canada*²² plan to provide \$3.3 billion in long-term infrastructure investments that will create jobs in the transportation sector. These funds create the potential for municipalities to improve and electrify rapid bus transit systems, expand the coverage of the LRT in and outside city centres, and invest in on-demand transit solutions. These investments could lead to 1,300 direct and indirect jobs during construction, and 20 operation and maintenance jobs.

Connecting rural Alberta to opportunities in city centres

In 2016 the Government of Alberta set aside \$1.4 million for six rural transit projects in the province as part of the Rural Transportation Pilot Program.²³ The intent of this program is to expand existing public transportation services in rural communities and build new services where gaps exist — such as the one left when Greyhound ceased operations in Alberta on Oct. 31, 2018²⁴ — as well as improve connectivity to urban centres. By 2019 all six projects were operational.²⁵ Some 40,000 Albertans who did not previously have access to transit service will benefit from this program, giving workers in rural Alberta who don't own personal vehicles access to more jobs across a larger region.²⁶

The varied nature of projects enabled through this fund makes it difficult to estimate the number of jobs it generated.²⁷

²² Government of Canada, “Canada and Alberta to make significant investments that will improve the lives of Canadians,” media release, April 3, 2018. <https://www.canada.ca/en/office-infrastructure/news/2018/04/canada-and-alberta-to-make-significant-investments-that-will-improve-the-lives-of-canadians.html>

²³ Government of Alberta, “Transportation projects connect rural Albertans,” media release, June 28, 2018. <https://www.alberta.ca/release.cfm?xID=56218C56C1313-E384-A4B7-F67A0C31C2C0731D>

²⁴ Greyhound, “Alberta.” <https://news.greyhound.ca/alberta>

²⁵ However, on April 10, 2020 the County Connector service in Grand Prairie was suspended until further notice due to risks surrounding COVID-19. Source: County of Grande Prairie No. 1, “County Connector Public Transit – Rural Transportation Pilot Program.” <https://www.countygp.ab.ca/EN/main/government/county-projects/rural-transportation-pilot-program.html>

²⁶ Government of Alberta, “More buses, better service for rural Albertans”, media release, July 25, 2018. <https://www.alberta.ca/release.cfm?xID=5738630CDA444-9CE5-AA25-B67554FCCEBFDAB2>

²⁷ Unlike Edmonton and Calgary’s projects, the Rural Transportation Pilot Program funds will not go into transportation infrastructure, so the same job factors will not apply. Program funding will go to regular shuttle bus services, regional transit services, family and community van services, and ride share programs.

2.2.3 Electric vehicle infrastructure

Electric vehicles (EVs) represent the next stage in the evolution of passenger and commercial vehicles.²⁸ Opportunities include personal vehicles, transit vehicles, commercial fleets, industrial vehicles, garbage trucks and even off-road vehicles and farm equipment. The Government of Canada has invested \$183 million in the public and private sectors to support the construction of refuelling stations for alternative fuels, such as coast-to-coast fast charging for electric vehicles and hydrogen stations in city centres, and is committed to developing a strategy to increase the number of zero-emission vehicles (ZEVs) on the road.²⁹

Through its *Electric Vehicle Strategy*, the City of Edmonton plans to have 85 publicly available EV charging stations installed by 2022, up from 19 in 2017.³⁰ The City of Calgary launched its official EV strategy in 2019, and now has approximately 175 EV charging stations across the city.³¹

Investments in EV charging infrastructure in Calgary and Edmonton alone have the potential to create 3,600 direct jobs and 2,900 indirect jobs in the province by 2030. Developing public charging infrastructure has the potential to create more jobs than installing residential EV chargers, because more skilled trades are required for more complicated installations, while the number of operation and maintenance jobs could increase with frequency of use. Charging stations need to be maintained yearly, and more frequently used chargers might need semi-annual or even quarterly maintenance.

Appendix 4 includes a brief discussion on the job potential of an EV manufacturing industry for Alberta, but currently EV manufacturing is concentrated in Ontario and Quebec, charger manufacturing happens predominantly in Quebec, and there are no indications of plans to create an auto manufacturing industry in Alberta. That is not to say Alberta cannot be a leader in the evolving EV industry: there are already efforts by several clean tech companies in Alberta to develop mineral extraction technologies and processes for EV components, for example extracting minerals for battery

²⁸ Peter Campbell, “Electric car rivals revved up to challenge Tesla,” *Financial Times*, September 21, 2018. <https://www.ft.com/content/3f5ded00-bd7d-11e8-8274-55b72926558f>

²⁹ Natural Resources Canada, “Travelling with an electric vehicle,” September 12, 2018. <https://www.nrcan.gc.ca/energy/efficiency/transportation/19198>

³⁰ City of Edmonton, *Edmonton’s Electric Vehicle Strategy* (2018), 36. https://www.edmonton.ca/city_government/documents/PDF/EdmontonElectricVehicleStrategy.pdf

³¹ Calgary Economic Development, “The future of electric vehicles in Calgary.” <https://www.calgaryeconomicdevelopment.com/newsroom/the-future-of-electric-vehicles-in-calgary/>

manufacturing from existing oil and gas infrastructure.³² Similarly, while conversations on the production and applications of hydrogen are increasing, manufacturing jobs for hydrogen in the transportation sector — specifically fuel cell and refuelling infrastructure manufacturing — are predominantly concentrated in British Columbia and Ontario.³³

2.3 Energy efficiency in buildings and industry

By 2038, the number of residential households in Alberta is expected to grow by 24% while the size of commercial and institutional space is expected to increase by 22%.³⁴ As our building sector's greenhouse gas emissions need to decline during that same time period, new building standards, as well as upgrades to existing infrastructure, will require new expertise, in turn generating employment opportunities.

The obvious benefit of pursuing energy efficiency improvements is to reduce electricity and heating bills for homeowners and businesses. Savings potential in Alberta could add up to \$2.5 billion in the residential sector, and \$7.1 billion in the commercial and industrial sectors.³⁵ Taking advantage of energy efficiency also creates new job opportunities. While designing and building residential and commercial spaces is well understood and relatively simple, industrial processes can be complex and challenging to adjust. Efficiency improvements for both industry and buildings are currently weighted heavily towards retrofits, so they are easier to implement, making it easier to create new jobs.

Energy efficiency is often a low priority for homeowners and businesses, due to high upfront costs and incremental annual returns, which means there is a need for policy drivers and financing mechanisms to enable job creation. In its first two years of operation, Energy Efficiency Alberta created 4,300 jobs in Alberta from energy efficiency programs, and generated \$3.20 growth for every \$1 invested in energy efficiency.³⁶

³² E3 Metals Corp, “Project Overview.” <https://e3metalscorp.com/>

³³ Cedric Smith, Carolyn Kim, Ben Sharpe, Nic Lutsey, *Power Play: Canada's role in the electric vehicle transition* (Pembina Institute and the International Council on Clean Transportation, 2020), 20. <https://www.pembina.org/pub/power-play>

³⁴ *2019-2038 Energy Efficiency and Small-Scale Renewables Potential Study*, 57-59.

³⁵ Dunsky Energy Consulting, *The Economic Impact of Improved Energy Efficiency in Canada* (2018), prepared for Clean Energy Canada, Table 23. http://cleanenergycanada.org/wp-content/uploads/2018/04/TechnicalReport_EnergyEfficiency_20180403_FINAL.pdf

³⁶ Energy Efficiency Alberta, *2018-2019 Annual Report* (2019). <https://efficiencyalberta.ca/annual-report>

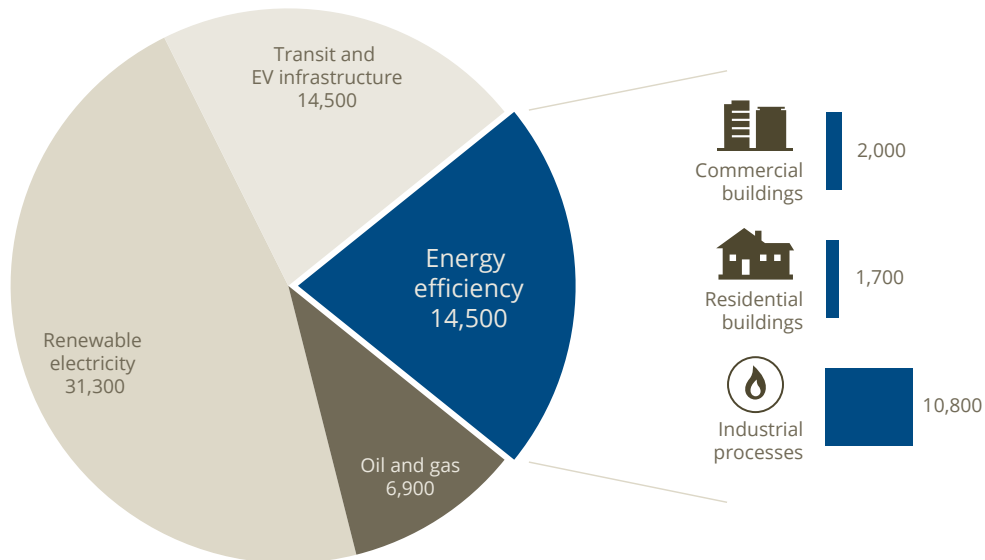


Figure 3. Jobs potential in energy efficiency in buildings and industry

2.3.1 Energy efficiency in buildings

Jobs in building efficiency are associated with design, construction, manufacturing and retail, and can sometimes involve reimagining how we live and do business. In addition to opportunities for new, specialized jobs, the buildings sector is well positioned to allow current practitioners to apply their skillsets to these new opportunities without the need for retraining. For example, construction of net-zero homes requires specialized building design, up-to-date insulation installation practices, and energy efficient fixtures and appliances.³⁷

The EEA's projections for reducing electricity and heating demand in Alberta will result in up to 1,700 jobs in residential energy efficiency, and up to 2,000 jobs in commercial energy efficiency by 2030.

³⁷ Canada Mortgage and Housing Corporation, *About Your House: Net-Zero Energy Housing* (2015). http://www.chba.ca/CHBADocs/CHBA/NZE/2018_CMHC-NZ.pdf

Recycling

Waste diversion is another pathway to reducing energy consumption and emissions that could generate jobs in Alberta, but only with a re-imagining of the entire waste cycle. Until recently, Alberta relied heavily on shipping its waste internationally for recycling; for example, Calgary used to send all of its mixed paper and 50% of its plastics to be processed in China.³⁸ However, countries that buy foreign recyclables are becoming stricter about what they accept, which means exporting recyclables is becoming less profitable, and more waste will likely end up in local landfills as a result.³⁹

Recycling is a labour-intensive process that depends heavily on collection, sorting, processing, manufacturing and logistics, and presents a significant opportunity for creating new jobs that require minimal training and experience. To maximize the job creation and economic growth opportunity of recycling in Alberta, we need to develop a local industry that turns our waste into a profitable product.⁴⁰

There is already strong interest within the province for diverting waste: In 2017, the City of Edmonton's goal was to divert 90% of residential waste from landfills (although it only achieved 52%);⁴¹ the City of Calgary aims to divert 70% of its waste from landfills by 2025.⁴²

Studies in the U.S. suggest that achieving 75% nation-wide waste diversion could create upwards of 2.3 million American jobs by 2030.⁴³

³⁸ Reid Southwick, "Calgary finds new markets for recyclables after Chinese ban," *CBC News*, May 9, 2018. <https://www.cbc.ca/news/canada/calgary/calgary-recyclables-new-market-china-ban-1.4655559>

³⁹ The Canadian Press, "Backlog means recyclable material could end up in a Calgary dump," *CBC News*, Jan. 9, 2018. <https://www.cbc.ca/news/canada/calgary/calgary-recycling-material-backlog-china-1.4479075>

⁴⁰ Lafarge Canada Inc., "Lafarge Hosts Major Lower Carbon Fuels Research Project With Academic And NGO Partners," January 11, 2018. <https://www.lafarge.ca/en/lafarge-hosts-major-lower-carbon-fuels-research-project-academic-and-ngo-partners>

⁴¹ Office of the City Auditor, *Waste Services Audit* (2018), 1,8. https://www.edmonton.ca/city_government/documents/audiofiles/17425_Waste_Services_Audit.pdf

⁴² City of Calgary, "Leading Calgary to zero waste." <http://www.calgary.ca/UEP/WRS/Pages/About-WRS/Calgary-Waste-Goals.aspx>

⁴³ Tellus Institute, *More Jobs, Less Pollution: Growing the Recycling Economy in the U.S.* https://www.tellus.org/pub/More_Jobs,_Less_Pollution_-_Growing_the_Recycling_Economy_in_the_US.pdf

2.3.2 Energy efficiency in industry

In addition to improvements for homes and commercial spaces, there are significant gains to be made in energy efficiency within industry processes. As a resource-based economy, Alberta's industry is energy- and carbon-intensive. In 2017, industrial energy use accounted for 75% of Alberta's energy demand (both electric and heating).⁴⁴

As the world decarbonizes its energy systems, improving process efficiencies is one important lever to maintaining competitiveness — including carbon-competitiveness — of our industry, creating and retaining jobs, and improving the environmental performance of the industrial sector.

Improving industrial efficiency is complex: energy monitoring and verification is much more technical, and facilities can have varying production schedules.⁴⁵ Industrial efficiency job opportunities range from service activities, such as monitoring and maintenance, to highly technical roles like energy modelling and process re-design, as well as regulatory jobs in policy development, regulation, tracking and enforcement. Process optimization offers significant potential for energy efficiency improvements in the oil and gas industry.

Based on the results of a recent study completed for Energy Efficiency Alberta (EEA),⁴⁶ we project that by 2030 the oil and gas sector could save up to 2,250 GWh of electricity consumption and 69,120 TJ of heating fuel consumption (see Appendix A.5). Looking at the province's total potential energy efficiency improvements in both electricity and heating this accounts for 30% of the former and 80% of the latter, due to the sector's dependence on thermal processing.⁴⁷ The subsequent savings would be equivalent to powering 31,000 homes and heating 57,000 homes for 10 years⁴⁸ while creating 8,500 jobs in Alberta's oil and gas sector (see Appendix A.5).

⁴⁴ “Provincial and Territorial Energy Profiles – Alberta,” Figure 6.

⁴⁵ Stephen Lacey, “Why Efficiency Is So Much Harder in Industrial Facilities Than in Commercial Buildings.” *Greentech Media*, September 24, 2013. <https://www.greentechmedia.com/articles/read/why-efficiency-is-so-much-harder-in-industrial-facilities-than-commercial-b#gs.qzgZWrvR>

⁴⁶ Navigant Consulting Ltd., *2019-2038 Energy Efficiency and Small-Scale Renewables Potential Study* (2019), prepared for Energy Efficiency Alberta. <https://eea-assets.s3.amazonaws.com/documents/Potential-Study-Report-2019-2038.pdf?utime=20190904113023>

⁴⁷ *2019-2038 Energy Efficiency and Small-Scale Renewables Potential Study*.

⁴⁸ Energy Efficiency Alberta, “Average Alberta Energy Consumption”, December 11, 2018. <https://www.energycanada.ca/average-alberta-energy-consumption/>

The EEA study also projects other industries (chemical, pulp and paper, manufacturing and farming) can achieve an electricity reduction potential of 1,970 GWh and heating reduction potential of 6,840 TJ by 2030. These savings could power 27,400 homes and heat 5,700 homes for 10 years, and create up to 2,300 jobs in these industries.⁴⁹

2.4 Environmental cleanup and methane reduction in the oil and gas industry

Oil and gas faces deep challenges as the world strives to reach net-zero emissions by 2050 to limit warming to 1.5 degrees Celsius. But the sector has and will continue to play a role in meeting our energy needs, and in fuelling Alberta's economy. Job creation that improves the sector's environmental and climate performance will help Alberta's economy remain competitive as the world moves to a 21st-century low-carbon economy. For this report we specifically look at the job potential realistically achievable by 2030 in two areas: environmental cleanup and methane emissions reduction.

For decades, inadequate incentives and relaxed regulations have allowed oil and gas cleanup to be neglected in Alberta. While the Alberta Energy Regulator officially estimates total cleanup costs of the sector at \$58 billion,⁵⁰ unofficial analysis conducted by the regulator suggests the real, industry-wide cost may be closer to \$260 billion.⁵¹ In order to realize job benefits, it is imperative the government deals with this growing backlog with more stringent regulations, and with policies that both facilitate and ensure that licensees and industry more aggressively tackle cleanup.

The oil and gas sector is a significant contributor to Alberta's carbon emissions — in 2018 it comprised 51% of the province's total greenhouse gas emissions.⁵² As the industry responds to global action on climate, and deploys innovative efforts to improve its competitiveness, investing in emerging opportunities will support the retention of jobs, while also improving both economic, environmental and climate performance.

⁴⁹ *The Economic Impact of Improved Energy Efficiency in Canada*, Table 8.

⁵⁰ Alberta Energy Regulator, "Statement from the Alberta Energy Regulator," November 1, 2018. <https://www.aer.ca/providing-information/news-and-resources/news-and-announcements/news-releases/public-statement-2018-11-01.html>

⁵¹ Jodi McNeill, "The Alberta government has a transparency problem when it comes to oil and gas liabilities," *Pembina Institute*, November 20, 2018. <https://www.pembina.org/blog/alberta-government-has-transparency-problem-when-it-comes-oil-and-gas-liabilities>

⁵² Environment and Climate Change Canada, *National Inventory Report 1990-2018: Greenhouse Gas Sources and Sinks in Canada* (2020). <https://unfccc.int/ghg-inventories-annex-i-parties/2020>

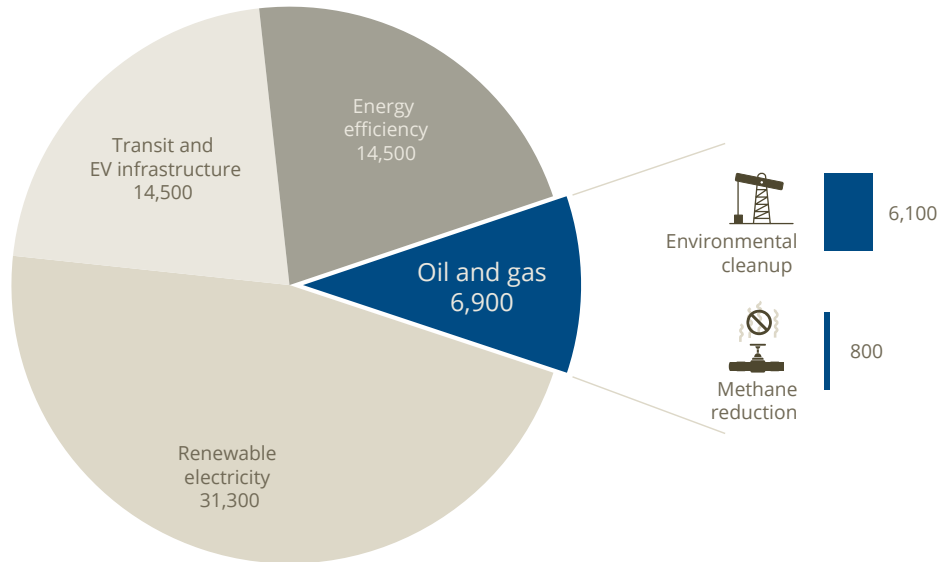


Figure 4. Jobs potential in environmental cleanup and methane reduction in the oil and gas industry

2.4.1 Environmental cleanup in the oil and gas industry

The oil and gas industry in Alberta includes conventional and unconventional oil and gas developments, with oilsands representing the largest share of hydrocarbons produced in Alberta today.

Cleanup, which includes decommissioning and reclaiming depleted oil, gas and oilsands sites, presents tremendous job creation opportunities. These opportunities have historically been dependent on operators themselves funding and performing cleanup activities; however, current policy does not ensure this occurs while companies are financially solvent.

The Alberta Energy Regulator (AER) has developed specific regulations to guide the decommissioning and cleanup of oil and gas infrastructure that has reached its end of life, including reclamation requirements for the three types of fossil fuel development occurring in the province:⁵³

- **Oil and gas site reclamation requirements** apply to upstream oil and gas operations, including conventional wells, pipelines and natural gas plants.
- **Mine reclamation requirements** apply to open pit mines for coal and oilsands production, including processing plants.

⁵³ Alberta Energy Regulator, “Reclamation.” <https://www.aer.ca/regulating-development/project-closure/reclamation.html>

- **In situ reclamation requirements** apply to oilsands wells producing bitumen using enhanced recovery techniques (also known as in situ technologies).

Due to the similarities between in situ well management and conventional well management, in situ reclamation potential is usually grouped with conventional wells. Meanwhile, because the AER has similar reclamation requirements for coal and oilsands mining, jobs estimated to clean up coal mines are included in the oil and gas sector.

We have calculated that decommissioning and reclaiming past fossil fuels production sites could create as many as 6,100 jobs in Alberta, including both mine and well reclamation.

2.4.1.1 Well cleanup

Out of the 336,000 existing wells in Alberta, the Government of Alberta estimates that 172,000 are active, 94,000 inactive⁵⁴ and 73,000 abandoned (meaning they are permanently shut down, but the sites are still waiting to be fully reclaimed).⁵⁵ This means that only half of the wells in Alberta are still producing, with the remaining waiting either to be brought back online, or to be decommissioned and reclaimed.

A weakness in the regulations allows producers to leave their wells sitting suspended indefinitely before the final steps of abandonment, remediation and reclamation (Figure 5). This is one of the reasons for a backlog of 94,000 inactive wells in Alberta, with the majority being in that state for more than five years.⁵⁶

⁵⁴ The AER deems a well inactive if it shows no production for 12 consecutive months (six months for critical sour wells). Source: Alberta Energy Regulator, “Directive 013: Suspension Requirements for Wells,” 2018. <https://www.aer.ca/regulating-development/rules-and-directives/directives/directive-013.html>

⁵⁵ Government of Alberta, “Upstream oil and gas liability and orphan well inventory.” <https://www.alberta.ca/upstream-oil-and-gas-liability-and-orphan-well-inventory.aspx>

⁵⁶ Alberta Energy Regulator, “Inactive Well Licence List,” retrieved on April 27, 2020. http://www.aer.ca/data/codes/Inactive_Well_Licence_List.xlsx

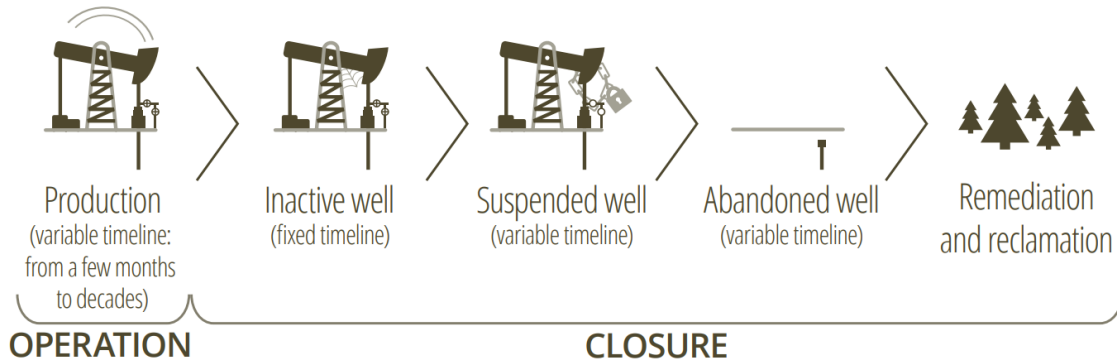


Figure 5. Life cycle of a well from active to reclamation

Source: Pembina Institute ⁵⁷

The decommissioning, abandonment, remediation and reclamation of inactive wells has the potential to generate 3,700 direct jobs and 1,000 indirect jobs. This estimate is considered conservative, because it only focuses on the 94,000 currently inactive and suspended wells, while ignoring the portion of the 172,000 currently active wells, which will have to be cleaned up upon reaching their end of life in the next decade, and the remaining remediation and reclamation work still needed on the 73,000 wells that have already been abandoned.⁵⁸

Further, as noted above, the AER’s regulation extends beyond upstream well cleanup, and includes gas plants and pipeline reclamation. There is insufficient data to estimate how many new jobs could be created from cleaning up this additional infrastructure. However, the AER regulates more than 422,000 km of pipelines⁵⁹ and 600 gas plants⁶⁰ in the province, which reinforces the assumption that job opportunities related to cleaning up oil and gas infrastructure in Alberta are enormous.

⁵⁷ The Pembina Institute, *Landowners Primer: What You Need to Know About Unreclaimed Oil and Gas Wells* (2019), 4. <https://www.pembina.org/reports/landowners-primer-on-unreclaimed-og-wells.pdf>

⁵⁸ Methodology used to estimate cleanup jobs is outlined in Appendix A.6.

⁵⁹ Government of Alberta, “Pipelines in Alberta: What Landowners Need to Know,” *Agriculture and Forestry*, May 25, 2018. [https://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/agdex1125](https://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex1125)

⁶⁰ Cap-Op Energy Inc., *Alberta’s Upstream Oil and Gas Assests Inventory Study: Opportunities to Reduce Greenhouse Gas Emissions at Existing Distributed Facilities* (2013), 12. <http://www.ptac.org/wp-content/uploads/2016/08/pema-inventory-report-final.pdf>

The fast-growing orphan wells problem

Among oil and gas liability issues is also the problem posed by orphan wells. A well becomes an orphan when it no longer has a company legally and financially responsible or able to deal with its closure and reclamation; for example, because the company that owned it went bankrupt. Such wells are then transferred to the Orphan Well Association (OWA),⁶¹ an organization historically funded by an industry levy. As of March 2020, there are more than 6,000 orphan wells (needing abandonment and/or reclamation), 3781 pipeline segments, and 297 facilities in the OWA's inventory.

Traditionally, there were a limited number of orphan wells, but the number has grown rapidly over the past few years, leading the federal and Alberta governments to contribute \$565 million in loans for orphan well cleanup over the past five years,⁶² in order to accelerate the reclamation of oil and gas well sites that no longer have a financially solvent owner.

A 2019 decision by the Supreme Court of Canada confirmed that, when companies go bankrupt, paying for cleanup costs should be prioritized before paying creditors. However, this decision does not fully clarify who will ultimately pay for cleanup, given that when companies go bankrupt, remaining assets are frequently insufficient to cover closure and reclamation costs.⁶³

Orphan wells are just the tip of the iceberg when it comes to the oil and gas liabilities, and raise serious concerns about funding this cleanup. Given current policies and the enormous price tag — estimates range from \$58 billion to \$260 billion⁶⁴ — for the eventual decommissioning and reclamation of all oil and gas infrastructure, there remains the possibility that a share of this cost will be borne by governments — that is, ultimately, taxpayers.

⁶¹ Orphan Well Association, “Welcome to the Orphan Well Association.” <http://www.orphanwell.ca>

⁶² Nigel Bankes, “Governance and Accountability: Preconditions for Committing Public Funds to Orphan Wells and Facilities and Inactive Wells,” *ABlawg*, April 24, 2020. <https://ablawg.ca/2020/04/24/governance-and-accountability-preconditions-for-committing-public-funds-to-orphan-wells-and-facilities-and-inactive-wells>

⁶³ Pembina Institute, “Redwater decision reassuring, but we aren’t out of the woods,” January 31, 2019. <https://www.pembina.org/media-release/redwater-decision-reassuring-we-arent-out-woods>

⁶⁴ Statement from the Alberta Energy Regulator, November 1, 2018.

2.4.1.2 Oilsands and coal mines reclamation

While hundreds of thousands of conventional oil and gas wells dot Alberta’s landscape, and active drilling continues especially in the shale oil-rich areas in Northwest Alberta, the vast majority of the province’s oil reserves are found in oilsands — a naturally occurring mix of extra heavy crude oil (known as bitumen), sand, water and other impurities. While representing only 19% of Alberta’s bitumen reserves, open pit mining currently accounts for just under half of Alberta’s crude bitumen production, with in situ extraction making up the remaining half.⁶⁵

Open pit mining is also used to extract coal burned for electricity, which still accounted for half of Alberta’s power generation in 2017.⁶⁶ In 2016, the Government of Alberta officially began the phase-out of coal-fired electricity generation by 2030, creating both the motivation and the need to reclaim some coal mines.^{67,68} Even without regulations mandating the phase-out of coal, trends in the United States have indicated coal-fired power plants are shutting down due to poor economics.⁶⁹

Over 200,000 acres of open pit oilsands and coal mines will eventually require reclamation.⁷⁰ Alberta Energy Regulator regulations hold mine operators responsible for returning sites to their original condition.⁷¹ The AER officially estimates the environmental liabilities of oilsands and coal mines to be \$31.4 billion as of June 2019,⁷² but their internal estimates suggest this could be higher.⁷³

⁶⁵ Alberta Energy Regulator, “Figure S3.1 Alberta crude bitumen production,” June, 2018. https://www2.aer.ca/t/Production/views/CrudeBitumenNarrativeGroupA_0/FigureS3_1Albertacrudebitumenproduction?:embed=y&:showShareOptions=true&:display_count=no&:showVizHome=no

⁶⁶ National Energy Board, “Provincial and Territorial Energy Profiles – Alberta,” January 22, 2019. <https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/nrgsstmprfls/ab-eng.html>

⁶⁷ Government of Alberta, “Phasing out coal pollution.” <https://www.alberta.ca/climate-coal-electricity.aspx>

⁶⁸ Some mines will continue to operate for export and to supply coal for industrial purposes. Their future depends on the global trends in coal usage.

⁶⁹ L. Michael Buchsbaum, “America’s coal plants closing despite Trump,” *Energy Transition*, June 25, 2018. <https://energytransition.org/2018/06/americas-coal-plants-closing-despite-trump/>

⁷⁰ Government of Alberta, “Oil Sands Mine Reclamation and Disturbance Tracking by Year,” *Environment and Parks*, October 31, 2017. <http://osip.alberta.ca/library/Dataset/Details/27>

⁷¹ Alberta Energy Regulator, “Mine Reclamation Requirements,” retrieved on April 27, 2020. <https://www.aer.ca/regulating-development/project-closure/reclamation/mine-reclamation-requirements.html>

⁷² Alberta Energy Regulator, “Mine Financial Security Program – Security and Liability,” 2019. https://www.aer.ca/documents/liability/MFSP_Liability.pdf

⁷³ Mike De Souza, Carolyn Jarvis, Emma McIntosh and David Bruser, “Alberta regulator privately estimates oilpatch’s financial liabilities are hundreds of billions more than what it told the public,” *National Observer*,

Based on the official estimate, there is potential for 800 direct jobs and 600 indirect jobs in mine reclamation in the next 40 years. These estimates exclude the reclamation of tailing ponds created by oilsands mines (see box below). With strong regulations and enforcement in place, a majority of these jobs would be created by operators.

Oilsands mine reclamation challenges

After 50 years of operations, the oilsands mining industry has not shown how to mitigate the long-term ecological impacts of treating and reclaiming fluid tailings. Far more intensive and transparent implementation and consultation with affected communities is required to address the technical, environmental and societal challenges related to fluid tailings treatment, reclamation approaches, and final landscape outcomes.

Securities collected for oilsands mines are only sufficient to cover 3% of the estimated reclamation costs.⁷⁴ This exposes communities and Alberta taxpayers to fiscal and environmental risk, as bankruptcies in the sector could result in these cleanup costs falling to the public. Moreover, current regulations have proven inadequate to incent oilsands companies to progressively reclaim their sites. This has resulted in a significant backlog of cleanup obligations, with only 0.1% of land disturbed by oilsands mining over the last 50 years currently certified as reclaimed.⁷⁵

Without sufficient incentives and penalties to promote progressive reclamation of oilsands mines, this opportunity for job creation could be missed. Besides the policy and regulatory enforcement needed to drive more responsible oilsands reclamation, there remain technological barriers to treating tailings because of the uncertainty around the long-term ecological impacts of treated or untreated oilsands tailings on the landscape.⁷⁶ Currently, there is no publicly available cost estimate for cleaning up a cubic metre of liquid tailings. Investing in addressing the tailings issue could, in fact, be a big contributor to creating highly technical jobs.

November 1, 2018. <https://www.nationalobserver.com/2018/11/01/news/alberta-regulator-privately-estimates-oilpatches-financial-liabilities-are-hundreds>

⁷⁴ Alberta Energy Regulator, “Annual Mine Financial Security Program Submissions — 2019 Submissions for 2018 Reporting Year,” 2019. https://www.aer.ca/documents/liability/MFSP_Liability.pdf

⁷⁵ Nina Lothian, “Fifty years of oilsands equals only 0.1% of land reclamation,” *Pembina Institute*, Oct. 13, 2017. <https://www.pembina.org/blog/fifty-years-of-oilsands-equals-only-0-1-of-land-reclaimed>

⁷⁶ Jodi McNeill, “Oilsands tailing ponds are a nasty challenge that can't be ignored,” *Calgary Herald*, April 27, 2018. <https://www.pembina.org/op-ed/oilsands-tailing-ponds-are-nasty-challenge-cant-be-ignored>

2.4.2 Methane reduction

Methane is the main component of natural gas and thus a valuable resource. It is also a greenhouse gas at least 84 times more potent than carbon dioxide over a 20-year period. As a result, it has a significant climate impact, especially in the short term.⁷⁷ Methane emissions occur in all parts of the natural gas supply chain including extraction, processing and transporting natural gas, and both the intentional and unintentional release of methane are common.

Reducing methane emissions to meet the current federal reduction target of between 40% and 45% below 2012 levels is already the lowest cost method of lowering greenhouse gas emissions within the sector. Recent analysis shows Canada could go beyond that to achieve reductions of 75% — for less than \$25/tonne CO₂e.⁷⁸ There is a significant opportunity to address climate concerns and conserve a valuable resource while making the oil and gas sector more carbon competitive: methane represents 19% of total greenhouse gas emissions from Alberta's oil and gas sector, worth over \$100 million per year in conserved gas over the next decade.

In addition to conserving a valuable resource, bringing both environmental and climate benefits, efforts to reduce methane emissions hold significant jobs potential. The skills and qualifications required for eliminating methane leaks overlap with those of current oil and gas workers,⁷⁹ and include jobs in leak detection and repair; equipment maintenance and replacement; creating and operating alert programs; technology pilot projects; training development and deployment; process development for surveying, monitoring, reporting and record-keeping; and policy development.⁸⁰

⁷⁷ International Panel on Climate Change, Fifth Assessment Report (2013). <https://archive.ipcc.ch/report/ar5/wg1/>

⁷⁸ Calculations based on Pembina Institute analysis of Evar Umeozor *et al.*, *Economic and Environmental Impacts of Methane Emissions Reduction in the Natural Gas Supply Chain* (Canadian Energy Research Institute, 2019). <https://ceri.ca/studies/economic-and-environmental-impacts-of-methane-emissions-reduction-in-the-natural-gas-supply-chain>

⁷⁹ Canadian Association of Petroleum Producers, “Methane plan can cut emissions by 45%, protect 7,000 jobs,” media release, October 30, 2017. <https://www.capp.ca/media/news-releases/methane-action-plan>

⁸⁰ South California Gas Company, *2018 Leak Abatement Compliance Plan* (2018), 1. [http://www.cpuc.ca.gov/uploadedFiles/CPUC_Website/Content/Safety/Risk_Assessment/Methane_Leaks/3\)%20SoCalGas%20Best%20Practices%20Report.pdf](http://www.cpuc.ca.gov/uploadedFiles/CPUC_Website/Content/Safety/Risk_Assessment/Methane_Leaks/3)%20SoCalGas%20Best%20Practices%20Report.pdf)

Data on Alberta's energy-related methane emissions, which represented 55% of Canada's total methane emissions in 2018,⁸¹ indicates a potential for 800 jobs created in methane management between 2020 and 2030.^{82,83}

Technology revolution in the oil and gas sector

New technologies are transforming the way we produce oil and gas and it is expected each employee will produce on average 17% more oil and gas in 2021 than they did in 2010 (27% for the oilsands sector).⁸⁴ These productivity gains are mostly due to the implementation of automation and digital technologies (e.g. development of sensors and remote control of production fields, driverless trucks for oilsands mining) in oil and gas fields, and particularly in the oilsands.

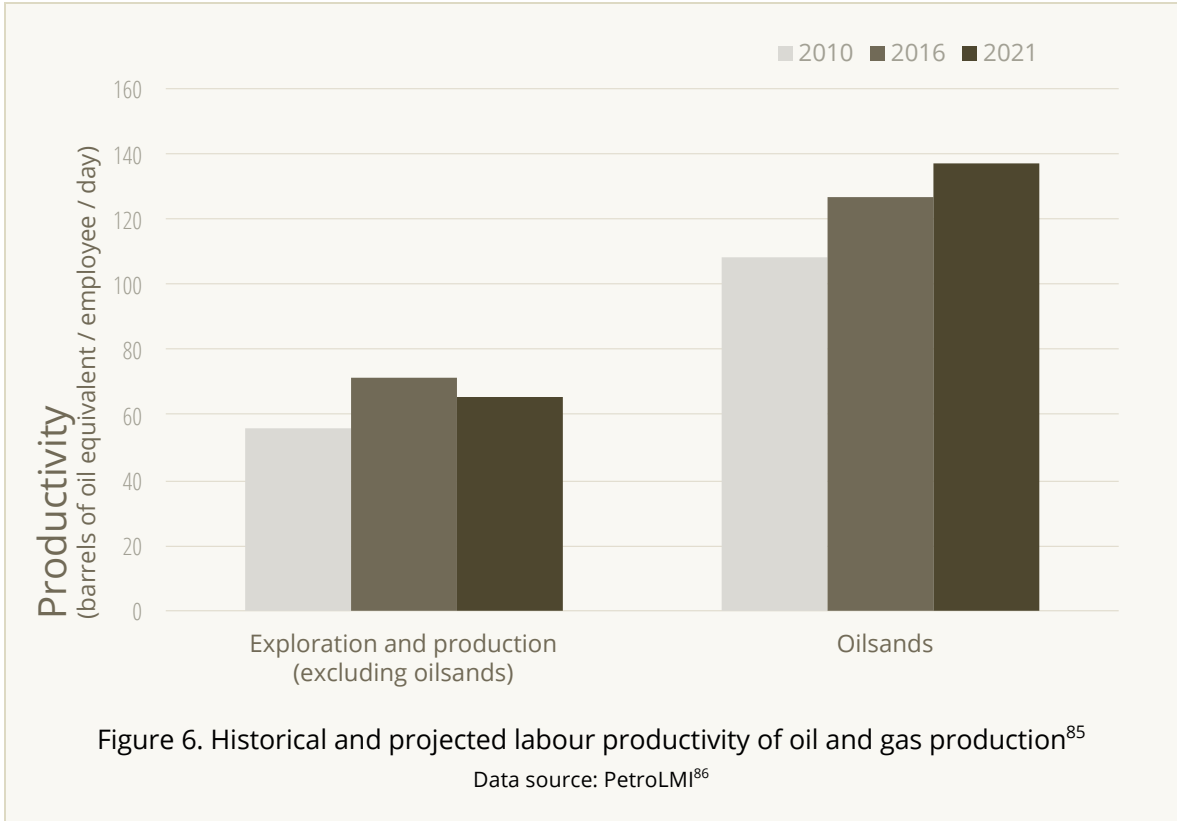
Figure 6 illustrates the increase in productivity since 2010, and expected productivity by 2021, indicating a further decoupling of oil production and number of workers — a trend that is particularly striking in the oilsands sector. This data shows that while oil production is expected to keep growing, the number of jobs in the sector will not necessarily increase. This further emphasizes the need for investing in the emerging economy, which has the potential to employ Albertans whose jobs have been replaced by automation.

⁸¹ *National Inventory Report 1990-2018*.

⁸² Government of Alberta, "Reducing methane emissions." <https://www.alberta.ca/climate-methane-emissions.aspx>

⁸³ Methodological notes are available in Appendix A.7.

⁸⁴ PetroLMI, *Labour Productivity in Canada's Oil and Gas Industry* (2017), 2. https://careers-oil-gas.s3.amazonaws.com/publications/24/en/LabourProductivityReport_2017_FINAL.pdf. Numbers from the modest recovery in 2021 scenario were compared to 2010 numbers.



⁸⁵ “Exploration and production” includes conventional and unconventional crude oil, natural gas and condensates; these projects are planned on a shorter timeline and have lower production quantities, making them easier to ramp down. “Oilsands” refers to bitumen produced using conventional mining and in-situ methods, as well as synthetic crude equivalent and diluent; these are large-scale projects with high bitumen production that are significantly harder to ramp down or cancel.

⁸⁶ *Labour Productivity in Canada’s Oil and Gas Industry, 2.*

3. Policies that enable job growth

Several global trends — including changing economics, consumer demand, climate action and awareness of health impacts — are contributing to the emerging economy described in this report. However, to ensure these sectors have sustained and significant growth in Alberta, a variety of policies need to be in place. The policies described below help create both incentives and certainty for investors and businesses to engage with the opportunities in these sectors and create jobs.

Pricing pollution

Economists agree that carbon pricing is the most effective lever for reducing carbon emissions.⁸⁷ In 2007, Alberta became the first jurisdiction in North America to put a price on carbon pollution from large industrial emitters. In 2017, Alberta introduced an economy-wide carbon tax.⁸⁸ The revenue from carbon pricing funded several programs for economic diversification — such as Energy Efficiency Alberta, Emissions Reduction Alberta and REP — as well as rebates for households. Alberta’s carbon pricing system resulted in investments in clean technologies in the electricity and oil and gas industries.

In 2019, the Government of Alberta repealed the carbon tax and the federal backstop came into effect in January 2020.⁸⁹ At the same time, the province redesigned and weakened the existing carbon pricing system for industrial emitters. Continuing to increase the carbon price, along with increasing the standards of federal methane regulations over time, is necessary to drive further innovation, and to ensure Alberta industries stay competitive with evolving industries worldwide.

Renewable energy policy certainty

Policy roadmaps — such as the (now-cancelled) REP, setting renewable energy targets, and modifying the regulatory framework and market to allow alternative energy providers (renewable energy, efficiency, storage, etc.) to monetize the contributions they provide to the overall grid — create certainty around the long-term plans for renewable investments in Alberta. This certainty sends a signal to investors and the

⁸⁷ OECD, *Effective Carbon Prices* (2013). https://www.oecd-ilibrary.org/environment/effective-carbon-prices_9789264196964-en

⁸⁸ Government of Alberta, “Carbon levy and rebates.” <https://www.alberta.ca/climate-carbon-pricing.aspx>

⁸⁹ Government of Alberta, “Carbon tax repeal,” 2019. <https://www.alberta.ca/carbon-tax-repeal.aspx>

local industry that renewable projects and related manufacturing are less risky investments, leading to more installed capacity, and enabling more construction, operation and maintenance, and manufacturing jobs. Programs to support distributed generation, including community generation, also have the potential to increase renewable energy jobs in the province, since distributed generation projects with associated community benefit agreements create more jobs per megawatt than centralized generation projects.

In addition, even greater penetration of renewable energy can be reached under policies that support investment in transmission infrastructure.

Residential, commercial and community renewable energy programs

Renewable energy programs that support installation costs, such as rebates for solar energy systems, or provide long-term revenue certainty, increase the uptake of renewable energy and subsequently create more sector jobs. Community solar generation in particular also allows greater participation by citizens, with many different financing models that make it easier for people to participate and share the benefits from the system.⁹⁰ These solar projects also create more local jobs than large-scale projects.⁹¹ This focus on solar is due to the underdevelopment of solar power in Alberta and the high job creation potential of solar power.

Coal phase-out

The Alberta and Canadian governments have committed to phasing out coal-generated electricity by 2030. This longer-term strategy provides long-term certainty to affected workers, communities and industry to plan for a transition away from coal.

Just transition

As the jobs potential increases in emerging sectors it is important to ensure that these opportunities enable a just transition. This implies having policies and programs in place that support workers and communities impacted by industries that are vulnerable to an energy transition, providing reskilling opportunities to enable workers to transition to the emerging jobs, and ensuring that the jobs created are well-paid jobs that protect workers' rights.

⁹⁰ Megan Zimmerman, Barend Donkers, "What is Community Energy?", March 21, 2016. <http://energyfutureslab.com/megan-zimmerman-barend-dronkers-what-is-community-energy>

⁹¹ Binu Jeyakumar, *Job Growth in Clean Energy* (Pembina Institute, 2016), 9. <https://www.pembina.org/reports/job-growth-in-clean-energy.pdf>

Investment in transit infrastructure

Transit infrastructure projects are large job-creation opportunities. Improving connectivity between communities also means residents have access to more job opportunities across all sectors and within broader regions. The Government of Alberta introduced legislation at the end of 2019 that allows them to cancel the LRT expansions in Calgary and Edmonton with 90 days notice.⁹² Ensuring that these projects proceed to completion locks in the job creation potential and the long-term emissions reductions that will come as a result of their operation. Continuing to invest in rural transportation options similar to the Rural Transportation Pilot Program will make sure Albertans are not left behind if traditional inter-city transportation providers cease operations.⁹³

Energy efficiency standards and funding

More efficient building standards and rebate programs encourage investment in energy efficiency and create related jobs. In addition, financing programs such as Property Assessed Clean Energy,⁹⁴ which make it easier to invest in longer-term efficiency upgrades, can increase the demand for associated services. Some jurisdictions are also incorporating efficiency into their legislation. For example, the Government of British Columbia's *Clean Energy Act* dictates that public utilities must offer energy efficiency financing to eligible businesses,⁹⁵ while the Utilities Commission Act's *Demand-Side Measures Regulation*⁹⁶ requires efforts to address public awareness of ways to increase energy efficiency.

Oil and gas cleanup

Policy options and job opportunities to address the environmental liabilities of oil and gas have not been effectively implemented in Alberta. Current policies fail to ensure that oil and gas wells are not left inactive indefinitely, and that companies contribute a form of adequate financial security before they are at risk of insolvency (especially in the case of oil and gas wells and oilsands mine development). As the industry-wide cost is so significant, in order to realize the majority of potential job benefits, it is essential

⁹² Government of Alberta, *Public Transit and Green Infrastructure Project Act*, S. 2019 c. P-43.8. <https://www.qp.alberta.ca/documents/Acts/p43p8.pdf> Sections 10(1) and (2) on page 3

⁹³ Greyhound, "Alberta." <https://news.greyhound.ca/alberta>

⁹⁴ PACEAlberta, "What is PACE?" <https://www.paceab.ca/>

⁹⁵ Government of British Columbia, *Clean Energy Act*, SBC 2010 c. 22 p. 5. http://www.bclaws.ca/civix/document/id/complete/statreg/10022_01#part5

⁹⁶ Government of British Columbia, *Demand-Side Measures Regulation*, B.C. Reg. 326/2008 http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/10_326_2008

that new policies are put in place to ensure the companies responsible for cleanup ultimately pay for this work. This includes requiring companies to fulfill their reclamation obligations in a timely manner — including decommissioning infrastructure and reclaiming land to its original state within a few years of ceasing production — and ensuring funds are available to undertake these efforts, for example, in the form of securities, bonds, or insurance.

On May 1, 2020 the Government of Alberta launched the *Site Rehabilitation Program*, which provides oilfield service contractors with grants to perform environmental cleanup. This \$1-billion program is being funded by the Government of Canada’s COVID-19 *Economic Response Plan* with the intention of creating new jobs during a time of economic uncertainty.⁹⁷

This program demonstrates that environmental cleanup can be an avenue for creating jobs within the oil and gas industry while improving environmental conditions in the province. However, government funding is not a sustainable model to ensure this work is done. Policies that ensure operators are financially accountable to reclaim their operations need to be considered proactively, especially outside moments of crisis, because of their proven job creation potential.

Methane

There is both domestic and international pressure to limit the climate impacts of Alberta’s oil and gas industry. Methane reduction is one of the most cost-effective ways to achieve this, while improving the carbon-competitiveness of the oil and gas sector and creating jobs. Alberta has committed to reducing methane emissions by 45% below 2012 levels by 2025. If the province is to achieve its desire of maintaining provincial jurisdiction over methane regulations, it will have to improve its rules to achieve the same outcome as the federal regulation, similar to B.C. and Saskatchewan.

Technology is improving rapidly and there is an opportunity for Alberta and Canada to increase ambition and exceed the current targets. Alberta has the ability to drive innovative technology solutions developed by Alberta businesses to help the oil and gas sector achieve methane reductions globally as well as to improve the carbon competitiveness of oil and gas produced in the province.

⁹⁷ Government of Alberta, “Site Rehabilitation Program.” <https://www.alberta.ca/site-rehabilitation-program.aspx>

4. Conclusion

Alberta has an opportunity to take advantage of growth in diverse economic areas including low-carbon electricity, low-emission transportation solutions, energy efficiency in buildings and industry, and environmental cleanup.

Alberta's emerging economy presents an important opportunity for the province's workforce with 67,200 full-time Albertan jobs that can be created by 2030, equal to 67% of the total workforce of the mining and oil and gas extraction industry in 2019.⁹⁸ Activities within the electricity sector are the highest potential contributor to jobs in this emerging economy, followed by transportation, and buildings, and finally oil and gas. Besides creating jobs, investing in these emerging industries also helps reduce greenhouse gas emissions, improve Albertans' health by decreasing air pollution, reduce costs for both industry and consumers, and improve Alberta's competitiveness and resilience in a changing global market.

Realizing this employment potential will require ongoing investment in these areas, and the implementation of supporting policies to provide certainty. The sooner concerted efforts and investments are directed at capitalizing on these opportunities, the sooner Albertans will reap the benefits.

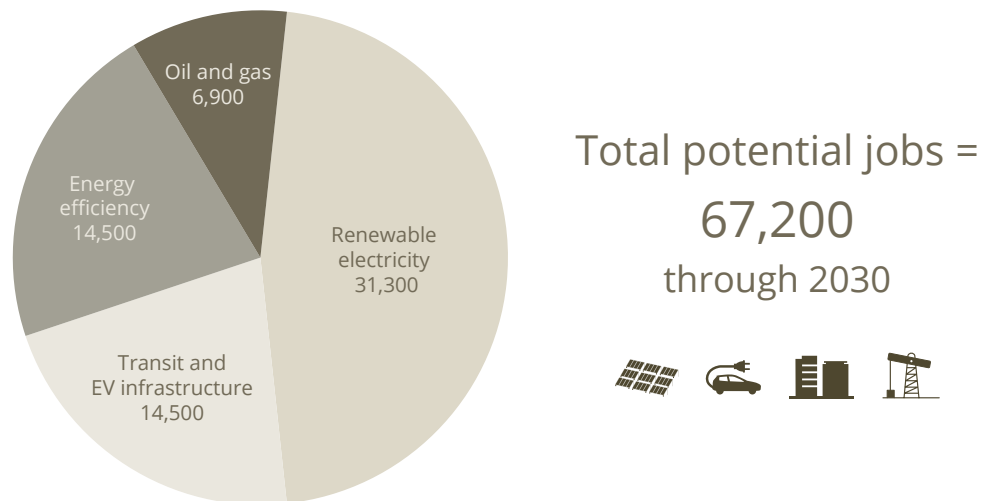


Figure 7. Potential for new jobs under areas of the decarbonizing economy in Alberta through 2030

⁹⁸ Statistics Canada, "Employment by industry, annual," Table 14-10-0202-01. <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1410020201>

Appendix A. Methodological notes

A.1 Job type definition and conversions

Direct jobs — on-site and off-site jobs that involve working directly on a project or at a facility. These include jobs related to design, development, construction, management, administration, finance, ongoing operations and maintenance.

Indirect jobs — supporting services and goods needed to enable direct jobs. These include activities along the supply chain, such as manufacturing and third-party equipment procurement.

Job-years vs. annual full-time equivalents (FTE) — different ways of measuring jobs. Job-years are the total years worked on a project across multiple employees; 50 job-years could mean 10 employees working for five years, or two employees working for 25 years. FTE jobs are the amount of time worked by employees in a full-time job; 10 FTEs means you employ 10 people full-time, or 20 people on a half-time basis. Job-years are considered less precise than FTEs because they don't consider employment period, and are often used to represent temporary jobs.

Job factor — an economic multiplier that describes how many jobs are created from every unit of investment. These units could be dollars invested or another comparable unit such as the size of a renewable project in megawatts.

A.2 Renewable electricity

The electricity sector's growth potential is based on AESO's *2019 Long-Term Outlook*, which forecasts electricity demand and generation in the province to 2030.

The growth of renewables could be much higher than the AESO forecast, if policies and programs are implemented beyond current commitments by the Alberta government.

The job potential in decarbonizing the electricity sector is calculated using the job factors in Table A2.1 below.

Table A2.1. Job factors for renewable electricity generation

Generation type	Job factor (FTE/MW for direct jobs)	
	Construction	O&M
Solar, utility scale, >15MW ^a	10	0.2
Solar commercial ^a	15	0.3
Solar residential ^a	20	1
Solar blended ^{*a}	12.5	0.3
Wind ^b	0.37	0.17
Wind manufacturing ^b	0.96**	0.070
Conventional hydro ^a	8.87	0.08
Run-of-river hydro ^a	5.76	0.04
Hydro blended ^{*a}	8.09	0.05

^a Pembina Institute⁹⁹

^b Delphi Group for CanWEA¹⁰⁰

* blended factors assume a 1:3:6 ratio of residential to commercial to utility-scale generation for solar, and a 1:3 ratio of run-of-river to conventional generation for hydropower

** without policy clarity in Alberta this is zero

A.3 Transit

The total number of jobs expected from each of Alberta's expanding public transportation projects are reported directly by the Government of Alberta. The breakdown into construction, and operation and maintenance jobs, where not explicitly stated, was calculated to be the same fractions as those jobs reported for the Calgary Green Line LRT. Job factors were not used to fill these gaps because assumptions inherent in the calculations would add up to a total number of jobs different than those in the official reports.

The job factors in Table A3.1 were based on the Calgary LRT Green Line expansion.

Table A3.1 Job factors for major public transportation projects in Alberta

	Job-years/\$ billion
Construction (direct/indirect)	4,390
Operations and maintenance	87

Data source: Government of Alberta¹⁰¹

⁹⁹ *Job Growth in Clean Energy*, 15-17.

¹⁰⁰ *Alberta Wind Energy Supply Chain Study*.

¹⁰¹ "Province commits to the Calgary Green Line."

A.4 Electric vehicle infrastructure

The number of publicly available EV charging stations that could be installed in Calgary and Edmonton was extrapolated from the City of Edmonton’s goal of increasing publicly available EV charging stations installed from 19 in 2017 to 85 in 2022.¹⁰² This level of growth was extrapolated to 2030: based on the current numbers of publicly available chargers, 191 charging stations would be added in Edmonton and 198 charging stations in Calgary.¹⁰³ It is estimated that an EV charger costs approximately \$11,086 to install.¹⁰⁴ The job factors for EV charger installation are shown in Table A4.1.

Manufacturing EVs and chargers would provide significantly more jobs, but there are no indications of plans to create such an industry in Alberta. For comparison, Table A4.1 also includes the jobs potential for manufacturing, and operations and maintenance, as estimated for Ontario, but these were not used in this report.

Table A4.1 Job factors for EV infrastructure, manufacturing, and operation and maintenance

Electric vehicle jobs		job-years/ \$ million
Infrastructure (charger installation and maintenance)	Direct jobs	9,000
	Indirect jobs	7,300
Manufacturing	Direct jobs	5,200
	Indirect jobs	5,900
O&M (regular EV maintenance jobs, not infrastructure maintenance)	Direct jobs	2,900
	Indirect and induced jobs	6,200

Note: Based on a study of the electric vehicle industry in Ontario; Alberta job factors are expected to be roughly similar. Data source: Kopperson et al.¹⁰⁵

¹⁰² *Edmonton’s Electric Vehicle Strategy*, 36.

¹⁰³ These numbers were calculated before the release of the City of Calgary’s EV strategy in 2019, which does not include a plan for how many total chargers the municipality aims to install.

¹⁰⁴ Costs were \$10,000 per installation in 2011, or \$11,086 in 2018 dollars. B. Kopperson et al., *GT80 Electric Vehicle Adoption Study* (2014), 83. <http://windfallcentre.ca/drive-electric/docs/studies/GT80-EVAdoptionStudy-FullReport.pdf>

¹⁰⁵ *GT80 Electric Vehicle Adoption Study*, Table 7, Table 12, and Table 19.

A.5 Energy efficiency in buildings and industry

A recent Energy Efficiency Alberta study estimates the available electrical and heating reduction potential in Alberta over the period of 2019 to 2038 for residential, commercial and industrial sectors (oil and gas, and non-oil and gas).¹⁰⁶ The electricity and heating demand for each sector was estimated by multiplying the energy intensity of each sector with the stock forecast for that sector (Tables 2-11 to 2-15 in the EEA report). Both the energy intensity and the stock forecasts were interpolated back from 2038 to 2030.

The available electricity and natural gas savings potential total were estimated in the report (Tables 5-12 and 5-13). The potential reductions available in the residential, commercial, and non-oil-and-gas sectors are calculated as the same fraction of each sector's demand by 2030. The reduction potential of the oil and gas sector is the difference between the two columns in Tables 5-12 and 5-13 titled "Total (excludes Oil & Gas)" and "Total (includes Oil & Gas)". Similarly, the reduction potentials were interpolated from 2038 to 2030.

Finally, using rows 2 and 4 of Table 5-11, we calculated the program spending required to achieve these reductions. The job factor used to calculate the number of jobs created by energy efficiency improvements came from a study of the economic impacts of energy efficiency investments under the pan-Canadian framework, which reported 30 job-years per \$1 million of program spending.¹⁰⁷ The actual job factors for Alberta may be different depending on the supply chain for the materials used for the efficiency upgrades.

A.6 Cleanup of past oil and gas operations

The jobs potential of cleanup activities were calculated using job factors from Alberta — or closest applicable jurisdiction — multiplied by the amount of reclamation work required. The calculations here assume that regulations and investments are in place to conduct all activities over the next 40 years.

The jobs estimates for oilsands and coal mines only consider disturbed open pits, and the land surface area covered by tailings ponds, but do not include the treatment of

¹⁰⁶ Navigant Consulting Ltd., *2019-2038 Energy Efficiency and Small-Scale Renewables Potential Study* (2019), prepared for Energy Efficiency Alberta. <https://eea-assets.s3.amazonaws.com/documents/Potential-Study-Report-2019-2038.pdf?utime=20190904113023>

¹⁰⁷ *The Economic Impact of Improved Energy Efficiency in Canada*.

tailings liquids. Oilsands mines differ from coal mines because of the need to reclaim tailing ponds. Tailings are not included in the environmental liability estimates of oilsands mines because they present significantly different reclamation challenges from those oil and gas wells or coal mines. Table A6.1 shows the total job potential estimated for all coal, oil and gas facilities in the province.

Table A6.1 Total job creation potential in cleanup activities

Job factor	Reclamation work required	FTE/year until 2030
0.40 direct FTE per well ¹⁰⁸	94,000 inactive wells ¹⁰⁹	3,700
1.254 indirect FTE per direct FTE ¹¹⁰		1,000
7.4 direct FTE per \$1 million CAD ¹¹¹ of spending ¹¹²	\$4 billion in environmental liabilities ^{113*}	800
6 indirect FTE per \$1 million CAD of spending ¹¹⁴		600

* excludes the cost of cleaning up tailings pond liquids

¹⁰⁸ The job factor is derived from a 2019 Petroleum Services Association of Canada (PSAC) study and assumes the following distribution of the 91,000 inactive wells: 51% are single wells and 49% median wells. In the absence of data on cleanup work required on each of the 91,000 inactive wells, it is assumed that no well requires more complex reclamation and remediation work ('Complex well' category in the PSAC study), which makes this analysis conservative. Cleanup activities considered include: suspension, decommissioning, abandonment, remediation and reclamation of the site. Source: PSAC, *Well Closure Workforce Study*, 2019. https://www.pfac.ca/wp-content/uploads/2019/12/Well_Closure_Workforce_Study.pdf

¹⁰⁹ "Addressing Upstream Oil and Gas Liability and Orphan Well Inventory."

¹¹⁰ Multiplier is for NAICS 56200 (Waste management and remediation services) and sourced from: Government of Alberta, *Alberta Economic Multipliers: 2013*, Table 2 (2017). <https://open.alberta.ca/dataset/47490b9d-5805-4be3-8174-068d72ec9101/resource/d118ada7-d99c-4ede-bd36-8a1df7f05d9b/download/Alberta-Economic-Multipliers-2013.pdf>

¹¹¹ Calculations have been made after adjusting from \$USD in 2014 to \$CAD in 2020.

¹¹² Labor Network for Sustainability, *Employment after Coal: Creating New Jobs in Eastern Kentucky*, 2016. https://labor4sustainability.org/files/KYcleanenergy_final_03032016.pdf

¹¹³ Government of Alberta, "Oil Sands Mines Reclamation and Disturbance Tracking by Company to the End of the Reporting Year" *Environment and Parks*, October 31, 2017. <http://osip.alberta.ca/library/Dataset/Details/29>

¹¹⁴ "Employment after Coal: Creating New Jobs in Eastern Kentucky."

A.7 Methane reduction

The jobs potential in methane reduction is calculated based on estimates from Blue Green Canada, which in June 2017 reported the job potential in methane management in Canada at 1,500 jobs/year.¹¹⁵ This is the most recent methane job potential estimate in Canada.

The methane reduction potential in Alberta's energy sector is estimated by calculating the fraction of methane emissions from the province relative to total Canadian methane emissions. The latest National Inventory Report prepared by Canada for the United Nations Framework Convention on Climate Change earlier this year estimates 26,000 Mt CO₂e of methane emissions from Alberta's energy sector,¹¹⁶ which comprises 55% of the total Canadian methane emissions related to energy (47 Mt).¹¹⁷ As a result, the estimated job potential of methane in Alberta from 2020 to 2030 is calculated to be 830 jobs/year.

¹¹⁵ Blue Green Canada, *Don't Delay: Methane Emission Restrictions Mean Immediate Jobs in Alberta* (2017), 7. <http://bluegreencanada.ca/methane>

¹¹⁶ "Reducing methane emissions."

¹¹⁷ *National Inventory Report 1990-2018*, 32.