



Alberta's Approach to Energy Transition

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Introduction

In the global race towards energy transition, two distinct strategies have emerged to meet growing global demand for affordable and reliable energy while reducing greenhouse gas emissions. On one side, we have the rapid transition approach—a call for an immediate and wholesale shift to clean energy, in particular by moving towards an almost complete reliance on renewable electricity. On the other, the “all of the above” strategy aims to reduce emissions from all sources while maintaining a diverse energy mix, including the use of lower carbon intensity fossil fuels. This debate is particularly intense within Canada, where many environmental advocates and federal politicians push for a rapid transition, even as Alberta, the country’s energy powerhouse, champions the “all of the above” approach.

Rapid Transition vs. “All of the Above”

The rapid transition camp envisions a world powered entirely by renewable sources, advocating for the swift deployment of wind and solar power, accelerated development of energy storage technologies, widespread electrification of transportation and heating systems, and a rapid phase-out of fossil fuel production and use. Champions of this approach, including Canadian Environment and Climate Change Minister Steven Guilbeault and many within the Trudeau government and among NDP, Bloc and Green politicians at the federal level, argue that only a complete break from fossil fuels can avert climate catastrophe and meet ambitious international targets.

But Alberta, Canada’s most important energy producing province with its vast oil and gas reserves, takes a different tack. The Danielle Smith government has embraced an “all of the above” approach, seeking to clean its existing energy infrastructure while investing in new energy sources and cutting-edge clean technologies. This strategy focuses on developing technologies to reduce emissions from fossil fuel systems, implementing carbon capture and storage (CCS) technologies, and exploring increased use of fuels like blue hydrogen and liquefied natural gas (LNG), and new sources of energy – not only renewables such as wind and solar, but other alternatives including geothermal energy and small modular

nuclear reactors. Alberta has outlined its approach in its Emissions Reduction and Energy Development (ERED) plan, which, as Premier Smith puts it in her introduction, “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.”

Cleaning Alberta's Electricity Grid

Alberta's approach is yielding tangible results, starting with the remarkable transformation of Alberta's electricity grid. The province has phased out coal usage years ahead of schedule. As recently as 2001, over 80 percent of Alberta's power supply was derived from coal. By 2024, coal-fired power production has been entirely phased out – six years ahead of schedule. This has been accomplished by the rapid scaling up of both renewables and cleaner burning natural gas. This shift underscores Alberta's commitment to reducing emissions while maintaining a reliable power supply.

Alberta leads Canada in new wind and solar installations, transforming its energy landscape. This surge in green power, while promising, presents challenges in grid integration and reliability. The Alberta Electric System Operator (AESO) is working on balancing these new renewable sources with the need for a stable and reliable power grid. In 2023, Alberta added more than 500 megawatts of solar power capacity, making it the largest producer of solar energy in Canada. The ERED plan also emphasizes the need for reliable and affordable energy, balancing the growth of renewables with the practicalities of maintaining energy security. Additionally, Alberta is exploring the potential of hybrid renewable energy systems, which combine wind, solar, and battery storage to enhance grid stability and reliability.

Alberta faces the challenge of cleaning the grid even as demand for electricity is increasing. New megaprojects in the petrochemical sector and other industries and increasing oil and gas production will add demand for electricity, as will the growing global demand for electricity for

data centers for artificial intelligence, cloud storage and cryptocurrency. Alberta is well poised to meet that demand, but only if federal and provincial governments get the policy mix right.

The next phase of cleaning the grid will involve a judicious mix of renewables, natural gas with carbon capture, and new and emerging sources such as geothermal, hydrogen and nuclear. Batteries and other storage technologies can help smooth demand loads and ensure backup power. But meeting growing electricity demand and ensuring reliability and affordability are equally important objectives as cleaning the grid. Policy makers and electricity producers alike will need to move carefully to ensure that as Alberta moves from a high carbon to a low carbon grid that there aren't artificial regulatory barriers or deadlines that block the progress that Alberta has already demonstrated.

Leadership in Carbon Capture and Storage

For both electricity generation and industrial production in the oil and gas sector and beyond, carbon capture and storage has emerged as a key technology – and a key Alberta advantage. Indeed, Alberta’s favourable geology with the basal Cambrian sandstone formation in the Western Canada sedimentary basin is almost uniquely well suited to carbon capture. Alberta is positioning itself as a global leader in CCS technology, with notable projects like Shell’s Quest facility and the Alberta Carbon Trunk Line already operational. The Quest CCS project alone has captured over five million tonnes of CO₂ since its inception. Additionally, the Pathways Alliance — a consortium of Canada’s six largest oil sands producers (and where this author is employed)— is aiming to reduce its emissions so that the Canada’s largest source of oil production in the oil sands is not only cost competitive with other global oil basins, but carbon competitive as well. Pathways is developing one of the largest CCS projects in the world in northeastern Alberta which would reduce emissions from oil sands operations by an initial 10-12 million tonnes per year with the potential to ramp up to much higher emissions reductions.

Alberta’s ERED plan highlights large-scale support for CCS as essential for meeting climate goals. Alberta has moved to introduce an Alberta Carbon Capture Incentive Program which would layer on top of federal incentives to provide strong support for CCS investments. Alberta also has a well-advanced regulatory framework for carbon sequestration, creating a network of 26 carbon sequestration hubs with regulatory responsibilities between government, carbon suppliers, and hub operators clearly delineated.

In recent months, Alberta has seen several major CCS announcements, including final investment decisions for the next stage of Shell and ATCO’s Atlas Carbon Storage Hub, Entropy’s commitment to implement CCS on Advantage Energy’s Glacier natural gas plant, and new CCS projects from oil sands producer

Strathcona. Other major projects are also on the horizon, including cement giant Heidelberg’s plans to build the world’s first net zero cement plant by implementing CCS on its Edmonton facility.

Carbon capture and storage are also key to decarbonize Alberta’s booming petrochemical sector. Significant investments are flowing into clean energy projects across Alberta. For instance, Air Products is investing in a \$1.3 billion blue hydrogen facility in Edmonton, which will produce hydrogen with minimal carbon emissions by capturing and storing the CO₂ generated. Meanwhile, Dow Chemical is building the world’s first net-zero ethylene cracker and derivatives site in Fort Saskatchewan, also relying on CCS.

Meeting – and Greening - Oil and Gas Demand

While some forecasters have predicted that oil and gas demand will eventually peak and decline as the world moves towards net zero goals, thus far we are continuing to see increases in global oil and gas demand. The International Energy Agency – which said in 2021 that oil demand would have to decline to 77 million barrels per day by 2030 to meet its net zero scenario – is now calling for global oil demand of 106 million barrels per day by that year. Since the COVID recession year of 2020, Alberta has seen natural gas production grow from about 10 billion cubic feet per day to about 12 billion cubic feet today. Conventional oil production has increased from about 400,000 barrels per day to 500,000 barrels per day. And bitumen production from the oil sands has grown from about 3 million barrels per day to 3.5 million barrels per day. With the TransMountain Pipeline now allowing an additional 600,000 barrels per day to reach new markets from California to India, and LNG projects from LNG Canada to Cedar LNG allowing Alberta gas to get to Asian markets, we can only anticipate higher global demand for Alberta's product.

But as the world embraces climate goals, there will also be an increased demand for lower carbon sources of oil and gas. And Alberta is well positioned to meet that challenge. Not only can carbon capture help decarbonize oil sands production, but Alberta is a global leader in reducing methane emissions from its conventional oil and natural gas production. Alberta met its goal of reducing methane emissions by 45% from 2014 levels by 2022 – three years ahead of its 2025 target. And Alberta is now on track to meet a 75% reduction in methane emissions by 2030. For the past two years, Alberta's oil sands have had flat

or declining emissions even as production has continued to increase. In fact, emissions intensity from the oil sands is down 23% per barrel in the past 12 years. Again, Alberta is on track to reduce emissions in its oil and gas sector even as it increases production to meet growing demand. But federal and provincial policies will have to work together to ensure that this continues.

Attracting Investment in Clean Technologies

Building for the future will require not only the deployment of existing technologies like carbon capture and renewables, but a plethora of technologies that do not exist yet at the commercial scale – or in some cases are still only on the lab bench or ideas in the minds of bright graduate students.

Attracting investments in clean energy technologies is crucial for Alberta's transition. The province is leveraging funds like the Alberta Investment Management Corporation's (AIMCo) \$1 billion energy transition fund to support various clean technologies and infrastructure projects. These investments are expected to drive significant economic growth and job creation. The ERED plan includes initiatives to attract and support investments in clean technologies, underscoring Alberta's commitment to innovation-driven emissions reductions. In addition, Alberta is fostering partnerships with international companies and research institutions to accelerate the development and deployment of cutting-edge energy technologies. Alberta-based companies from geothermal pioneer Eavor to Carbon Upcycling that uses captured industrial CO₂ to improve the performance of cement, concrete and other materials. Two Alberta agencies – Alberta Innovates (focusing on early-stage technologies) and Emissions Reductions Alberta (focusing on market-ready, deployable technologies) are helping to identify and support potential clean tech and clean energy unicorns in the Alberta ecosystem.

Alberta's energy sector is also exploring new frontiers. Alberta is already Canada's leading market for the use of hydrogen in

industrial processes, but there is growth potential as industrial grey hydrogen (produced by steam methane reforming of natural gas) is supplemented by blue hydrogen (steam methane reforming with the addition of carbon capture) and green hydrogen (hydrogen produced by electrolysis using clean sources such as renewables or potentially nuclear), which provide a very low or zero emissions source of fuel or energy storage. There are potential domestic markets for clean hydrogen as a residential and commercial heat source, and for use in transportation in buses, heavy trucks or trains. There are also export opportunities to send hydrogen to Asia or other markets in the form of ammonia. Alberta has a well developed hydrogen road map and the Edmonton Industrial Heartland is emerging as one of the two or three largest potential hydrogen hubs in North America.

There are other opportunities beyond oil and gas and petrochemicals. Recent regulatory changes are enabling the extraction of critical minerals like lithium from oilfield brines, supporting the development of domestic and global value chains for battery technologies essential for renewable energy storage. This initiative aligns with both provincial and federal critical minerals strategies, highlighting Alberta's role in the global

energy transition. Alberta is also investing in research and development for advanced battery technologies, including solid-state batteries, which promise higher energy densities and improved safety compared to conventional lithium-ion batteries.

Alberta's commitment to innovation is also evident in its support for small modular reactors (SMRs). These advanced nuclear reactors are being explored as a potential low-carbon energy source that can provide reliable power and complement intermittent renewable energy sources. SMRs are seen as a key technology for achieving long-term emissions reductions and enhancing energy security. Additionally, Alberta is partnering with other provinces and the federal government to develop a pan-Canadian SMR roadmap, which outlines the steps needed to bring SMRs to market and integrate them into the energy grid.

All of these new technologies can play a role in ensuring that the next generation of energy production in Alberta will be as revolutionary as the last one has been in increasing access to energy while continuing to cut emissions.

Indigenous Partnerships

Another unique aspect of Alberta's approach to energy transition is the pivotal role of indigenous partnerships. Indigenous leadership and participation are an integral part of almost every major project proceeding in Alberta. The Alberta Indigenous Opportunities Corporation (AIOC) supports Indigenous communities in investing in natural resource projects, fostering economic and social development. Among the major projects backed by the AIOC are partnerships between Enbridge and more recently TC Energy that have seen dozens of first nations take equity stakes in their major pipeline networks, and the Cascade Power Project where six First Nations have partnered in a \$1.5 billion natural-gas power generation facility in Edson, Alberta that will meet 8% of Alberta's power demand. In addition to these major investments in conventional energy sources, the ERED plan recognizes the role of Indigenous communities in achieving emissions reductions and outlines strategies for partnership and investment. For instance, the Frog Lake First Nation is involved in a solar energy project that aims to provide clean electricity to their community and generate economic benefits. Additionally, the Métis Nation of Alberta is partnering with the provincial government on a geothermal energy project that will harness the earth's natural heat to produce clean energy and create local jobs.

Meeting Energy Demand and Regulatory Alignment

Alberta has made remarkable progress over the past decade in cleaning its grid and greening its oil and gas production and other heavy industries. This progress is often not recognized or heralded beyond the borders of the province. But for Alberta's progress to continue, the federal and provincial government will have to move from a contradictory to a complementary policy mix. The province's strategy clashes at points with current federal policies, such as the draft Clean Electricity Regulation – which aims for a net zero electricity grid by 2035 – and the proposed oil and gas emissions cap, which is targeting emissions reductions of between 20 and 38 percent from 2019 levels by 2030. Alberta argues that these targets are unrealistic and could lead to unreliable electrical grids and forced reductions in oil and gas production. Alberta's ERED plan stresses the importance of setting achievable targets and maintaining economic stability while pursuing emissions reductions. Furthermore, Alberta is advocating for a flexible regulatory framework that supports innovation and allows for the integration of emerging technologies, such as carbon capture and utilization and advanced nuclear reactors, to meet its energy and environmental goals.

Federal policy has to recognize the progress that Alberta has made and help work with Alberta so that it can continue its leadership in providing clean and reliable energy to Canada and the world – whether in electricity, oil and gas, or new technologies – without artificial and arbitrary objectives like achieving a net zero grid by 2035 or dramatic reductions

in oil and gas related emissions even as global demand for oil and gas is rising. Federal policy should ensure that Alberta can continue to lead Canada and the world in cleaner energy production for as long as global demand for oil and gas persists.

Conclusion

Alberta's comprehensive energy transition plan exemplifies a balanced approach, aiming to reduce emissions across all energy sources while ensuring economic stability and energy security. It is truly an "all of the above" plan, as opposed to singling out fossil fuels for reductions not warranted by global demand. By leveraging its existing strengths in fossil fuels and emerging clean technologies, Alberta is positioning itself as a leader in responsible energy development. However, challenges remain, particularly in aligning provincial efforts with federal targets and balancing the rapid growth of renewables with grid stability. As Alberta continues to navigate these challenges, its experience will offer valuable lessons for other regions grappling with the complexities of energy transition.

Ultimately, Alberta's success will depend on its ability to adapt to changing energy landscapes, embrace innovative technologies, and find a sustainable balance between environmental responsibility and economic realities. As the global community continues to grapple with the urgent need for climate action, Alberta's pragmatic, diversified approach to energy transition may prove to be a model for other resource-rich regions around the world.

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