



Energy Trends to 2035: Foresight Report

*Forces which may shape the future of energy in
Alberta*

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Executive Summary

Alberta's energy system is an evolving and complex space, encompassing the set of elements, actors, and relationships involved in the development, delivery, and use of provincial resources to create energy. It is a coupled system where demand – internal and external to the province – determines need, and supply determines the availability of energy for consumption. The interface between supply and demand is a structure of markets, transport infrastructures, and institutions that help production match demand to value to Alberta and our clients. Our system is also shaped by the diversity of interests across actors operating in different regional contexts, the structure of national economies, regulatory frameworks, international agreements, political and social stability, and the consumer base.

As an energy producer, many features of Alberta's energy system over the next two decades are already evident. For example, fossil fuels will continue to play an important role in our lives and in Alberta's economy. While this direction will not change easily, this does not mean the future is set in stone. Small developments have the potential to change the expected course of Alberta's energy system in significant ways.

This report provides the initial results of scanning activities undertaken to identify energy-related trends that may take hold over the upcoming decades and foster change for energy in Alberta.

This study is intended to provide a forward-looking picture of the emerging environment for energy-related policy and strategy in Alberta in order to support Government of Alberta strategic discussions. This report is part of a larger strategic process and not a standalone exercise. As a subsequent step, an analysis of these trends will be undertaken in partnership with experts across government to ensure a comprehensive view of emerging trends. Subsequent work will identify those trends that are critical to consider when examining issues of adaptability, resiliency and testing strategic options.

How to read Energy Trends to 2035

This report was developed by Alberta Energy's foresight function in collaboration with subject matter experts in the Department of Energy and the Department of Environment and Parks.¹ The Report presents 28 trends that reflect patterns of behaviour, ideas, innovations and choices that may develop to be influential or persist into the future.

This report is divided into two sections. The first section provides an overview of forecasts that key organizations predict will with high likelihood shape the future of energy in Alberta over the foreseeable future (i.e. *probabilities*). The second section complements these forecasts by presenting a summary of foresight trends which are intended to be exploratory in nature (i.e. *possibilities*). As such, this section identifies trends that are weaker or just starting to materialize. While these may not have a strong or persistent impact in the present system, they have the potential to shift the trajectory of how energy development, production and use might evolve over time.

Alberta's energy system does not exist in isolation from the physical environment, the social fabric, international markets and the technology world, both at home and abroad. To this end, foresight perspectives are identified across five broad spheres (social, technical, environmental, economic, and political) and identified as Global, North America, Canada, or Alberta in scope. The organization of the report should be used as lenses for discussion rather than rigid categories.

¹ The presented trends stem from an analysis of over 300 signals (single events that indicate changes in behaviour, ideas, innovations, and choices) mined from a wide variety of sources including academic studies and articles, industry reports, government agency and NGO reports and releases, Think Tank products, thought leader articles, and conferences.

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Forecasts

Growing global energy demand – Global

Global energy demand is expected to increase by 25-to-48 per cent to 2040.

By 2040, the world's population will have reached 9 billion people. This means the energy needs of an additional two billion people will need to be met. New energy demand will also emerge as more people rise to the middle class and migrate to urban environments in emerging economies.

Industrializing countries will drive global energy growth - Global

Growth in global energy demand by 2040 will come from emerging economies, offsetting energy demand declines in industrialized countries.

China will lead global energy demand growth until passing the baton to India after 2025. A group of about 10 industrializing countries (including Egypt, Iran, and Bangladesh) is expected to experience strong increases in energy demand, potentially overtaking India and China after 2040 in terms of demand growth.

Climate value-action gap - Global

Recent announcements globally to address climate change have signaled a desire to take action, but a gap between legislation and commitments remains.

Since the failure of the Kyoto Protocol in 2012, skepticism has risen around the ability of actors to curb emissions. Climate action milestones at international, national and subnational levels have signaled ambitious targets – many of which include market mechanisms to capture carbon costs. However, there is still a gap between Intended Nationally Determined Contributions² and announced policies to meet emissions targets. Action will require significant economic and political will to close the gap.

Fossil fuels to remain the dominant global energy sources - Global

Fossil fuels will account for three-quarters of world energy consumption by 2040.

Fossil fuel consumption will grow by almost 20 per cent by 2040. Even though oil will remain the world's primary fuel, its primacy will be increasingly challenged due to fuel switching and efficiency gains. Global demand for coal will increase slightly. Natural gas will emerge as the fastest-growing fossil fuel thanks to its lower carbon intensity relative to other fossil fuels and relative abundance.

Cleaner fuels will expand the fastest - Global

Globally, natural gas and non-hydro renewables are set to grow more than any other energy sources by 2040.

While fossil fuels are set to remain the dominant energy sources for the next 25 years, cost reductions and efforts to limit carbon dioxide emissions will spur a rapid expansion of cleaner fuels, particularly natural gas and non-hydro renewables. Natural gas will surpass coal as the second-largest fuel source by 2040, while non-hydro renewables are set to overtake nuclear in the early 2020s and hydro in the early 2030s to become the fourth largest energy source of total energy consumption.

² **Intended Nationally Determined Contribution** is a term used under the United Nations Framework Convention on Climate Change (UNFCCC) and refers to reductions in greenhouse gas emissions announced by national governments as part of the Paris Agreement in 2015.

Fossil fuels price recovery – Global and Alberta

Oil and natural gas prices are expected to slowly rebound from 2017 onwards, but coal prices will remain relatively flat.

Crude oil prices are forecasted to strengthen as global supply and demand balance. By 2025 prices are forecasted to reach \$90 bbl Brent. Natural gas prices will also recover slowly; reaching 3 Cdn\$/GJ by 2017 and upwards of 4.29 Cdn\$/GJ by 2025. In the long term, demand for natural gas is forecasted to increase as climate change policies aimed at reducing emissions from coal-fired electricity generation prompt a switch to cleaner fossil fuels in climate-conscious jurisdictions. Meanwhile, coal prices will remain relatively flat in the mid-term due to lower average coal mine productivity, rising production costs, and declining coal demand.

The United States becomes Alberta's competitor in oil – North America

Alberta's biggest client, the United States, has also become Alberta's biggest competitor.

Increasing oil production in the US could displace Alberta's conventional and synthetic oil exports and compete with Alberta's lighter grades in other markets. Alberta is also set to face competition from the U.S. in investment attraction, as low prices and long-term uncertainties incentivize short investment cycles with fast pay-back (e.g. shale oil), to the disadvantage of capital intensive projects with long pay-back periods (e.g. oil sands).

King diesel – Global and Alberta

The product mix will shift significantly toward diesel fuel, driven in large part by strong growth in commercial transportation and relatively flat gasoline demand.

The global fleet of light-duty vehicles is expected to rise by close to 800 million vehicles by 2040, with 90 per cent of this growth taking place in emerging economies. While there may be more cars on the road, increasing fuel economies will result in a flattening of gasoline demand after 2020. The projected growth in global economic activity and trade will drive a 45 per cent increase in demand for commercial transportation fuel, mostly diesel. Heavy-duty vehicles will become the largest energy-consuming segment of the transportation sector.

Greying population - Canada

There are now more people in Canada age 65 and over than there are under age 15, according to Statistics Canada.

As the baby boom cohorts grow older, fertility rates are declining among younger generations. This trend generally follows similar patterns in other industrialized countries. However, the birthrate of Canada's Indigenous population will continue to increase more rapidly than non-Indigenous populations.

Relevance

- International trade of hydrocarbons will increasingly shift toward East Asia – benefiting markets able to access these emerging economies.
- Competitiveness pressures, export infrastructure constraints, cumulative effects mitigation and cost will continue to drive Alberta’s investment attractiveness.
- Alberta will continue to be a marginal producer.
- Alberta’s oil exports will experience an uptick in demand in times of supply tightness after 2025, following flattening of US production and increasing global demand.
- The U.S. Gulf Coast will remain the ideal market for Alberta’s crude.
 - Traditional suppliers (Mexico and Venezuela) have been experiencing declining production; consequently, Gulf refineries are seeking alternative supplies.
 - Diesel demand is increasing both in the US and abroad, as such the Gulf Coast wants to situate itself to serve the diesel market.
- Use of steam-assisted gravity drainage (SAGD) to extract bitumen will increase the emission intensity of bitumen extraction.
- The shift from new oil developments to modular expansions will intensify the environmental impacts of bitumen production on areas already affected by current production.
- Alberta’s natural gas will see a significant turnaround in light of a growing domestic market driven by oil sands, electricity generation, and petrochemicals.

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Social

Measuring growth beyond GDP - Global

Gross Domestic Product is being challenged as the most relevant measure of success in the face of changing values, business landscapes, demographics and inequality patterns.

Currently, GDP is the primary measure of economic health. Given an increasing inequality gap, there is a realization that GDP may not accurately reflect the distribution of growth to measure social, economic, ethical, health, and environmental wellness. A wide-range of “holistic indicators” are being developed to measure dynamics such as social return on investment, Human Development Index, Human Security index, Index on Economic Well-being, Genuine Progress Indicator, Gross National Happiness Index (GNH), and the Social Progress Index (SPI).

Relevance

- The changing focus from GDP to the wellness of society may influence business and investment decisions in current business models, and may influence investment in Alberta’s energy sectors.
- Should governments shift to measure against different (more holistic) measures of growth, there would be renewed interest in policy levers to achieve success against these new measures.
- Different communities in Alberta have different local needs and therefore may not prioritize these indicators of wellness the same. Government decision-making models for energy development may need to be adapted to better address community diversity.

Rise of the circular economy - Global

The ‘circular economy’ refers to an economic model where waste is used as an input, and the lifecycle of products is extended to enhance resource efficiency and sustainability.

The desire for greater sustainability is driving innovators to explore expanded value-chains to reimagine how we use materials and create energy. Governments are creating zero-waste incentives. Researchers and companies are developing more resource-efficient approaches to value creation that see waste products (e.g. carbon, heat) as assets and commercially viable inputs. By enabling the generation of value from waste, research suggests that the circular economy has the potential to unlock \$4.5 trillion of economic growth by 2030 and as much as \$25 trillion by 2050.

Relevance

- Encouraging the circular economy among waste streams may offer strategic diversification opportunities by creating complementary value streams from Alberta’s waste-intensive industries (e.g. oil, gas, mining).
- Identification of Alberta’s competitive advantage in technological innovation, interdisciplinary research, and global partnerships related to the circular economy could propel Alberta as a new industry leader.
- Incentivizing new industrial behaviour through regulatory/legislative frameworks and strategic actions related to industrial eco-clusters and market forces could help Alberta’s industries transition towards near-zero waste operations.
- The shift towards eco-cluster innovation would require stronger provincial and regional partnerships to ensure effective planning and land management.

Pipelines as symbols and tokens - Canada

Pipelines are becoming a symbolic site through which different groups negotiate their values, identities, and ideas as to Canada’s energy future.

Given current economic challenges, pipelines may continue to be seen as a symbol of the influence of Western Canada, as well as a threat to Quebec’s provincial autonomy, which may lead to continued political opposition and negotiations. Internationally, pipelines could entrench as symbols of “dirty” energy. Layered upon this discourse will be an ongoing public debate on environmental leadership and Canada’s position in a carbon-constrained future. Additionally, pipelines may increasingly become a symbol for the state of democracy and Indigenous rights. Amongst Indigenous groups, pipelines will likely continue to be an issue of contention concerning land stewardship and Indigenous partnership in development projects. The rights of indigenous peoples to be involved in development

decisions is currently gaining broader recognition and the public may expect to have a greater say in energy infrastructure projects.

Relevance

- As energy infrastructure is connected to broader values and ideologies, regulatory decisions will be increasingly based on issues beyond technical requirements.
- The more pipelines are leveraged as a symbol of identity politics, the harder it will be to gain social license in non-energy producing jurisdictions. Increasing expectations for inclusiveness may result in a greater role for government to steward the regulatory approval process, which may impact regulatory timelines.
- There is an increasing expectation for resource and infrastructure development to be more inclusive. The concept of social license has become pervasive and will affect the future development of natural resources beyond oil and gas.

Increasing scrutiny of energy development – Canada and Alberta

“Not in My Backyard” attitudes, coupled with increasing non-local pressure and scrutiny, may increasingly challenge development efforts in current and future energy sectors.

Energy development opposition by those who live near proposed sites will continue to be a barrier to the development of critical infrastructure in Canada. From the construction of windfarms, linear infrastructure, nuclear power, large-scale hydro and LNG, NIMBY attitudes continue to create wedge issues on the local and political landscapes. Amplified by recent high profile whistleblower incidents and scandals that have eroded public trust in major public and private institutions, scrutiny on energy development from non-local groups will continue to increase. Incidents of carbon liability disclosure, allegation of research suppression and perceived policy gaps have spurred distrust in all forms of energy development.

Relevance

- Scrutiny of Alberta by activists who identify oil sands moratorium as their primary objective may continue to capitalize on a public's increasing distrust of institutions.
- Public demand for government transparency and data openness related to provincial energy development may increase despite measures to address real or perceived public confidence gaps.

Arrested development in Alberta - Alberta

Alberta's momentum as Canada's economic powerhouse is stalling. Low oil prices, job losses, and stagnating growth may shift perceptions of Alberta both within and outside the provincial borders.

Between 2014 and 2015, Alberta's GDP decreased 4.0 per cent and lost nearly 20,000 direct jobs in oil and gas. An estimated 17,000 further jobs will be lost in 2016. Direct investment, employment rates, inward migration and overall economic activity continues to drop as the anticipated oil price recovery fails to materialize. Uncertainty persists as to the downturn's duration, and its impact on Alberta's economic position in Canada over the short and medium term. On the other hand, Alberta's unemployment rate remains slightly above the national average.

Relevance

- Expectations by political and public stakeholders for policy-makers to accelerate diversification may create pressure for market interventions.
- Potential decrease in economic clout may require greater diplomacy on the part of political and policy leaders to address barriers related to market access and economic development.
- Persistent economic decline may increase citizen and resident dependence on social programs and services.
- The Province cannot rely on non-renewable resource revenue to fund essential services alone.

Technological

Falling costs of battery storage - Global

Renewable energy technologies are intermittent sources of electricity requiring storage. Innovations in electricity storage are enhancing the viability of these technologies.

The lack of effective electricity storage options has resulted in the inability of renewable generation to reliably supply the energy grid. Improved storage capacity and enabling policies are the missing links between cleaner generation and more stable supply to meet increasing demand. The spillover effects of better battery storage will greatly impact the transportation sector and the uptake of electric vehicles. In preparation, some jurisdictions have committed to installing plug-in fuel stations.

Relevance

- Utility scale battery storage may allow for greater uptake of both locally distributed and renewable electricity generation and may stabilize the electricity grid during periods of intermittency.
- The potential electrification of light duty vehicles in the developed world could create changes to petroleum fuel demand patterns.
- Uptake of efficient, effective and affordable industrial battery storage and declining costs of renewable generation may reduce demand for natural gas for electricity generation in both Alberta and external markets.
- The production of batteries relies on rare earth minerals and could make renewable electricity storage vulnerable to price fluctuations and cartel actions. Switching from fossil fuel sources to renewable energy may shift dependence from one finite resource to another.
- Careful land management and strategic planning will be required to accommodate the expansion of renewable energy sources and allocate land for wind farms, solar fields, and biofuels.

Automation at work, on the road, and in your house - Global

Once considered a futuristic fantasy, robots and automation are entering the mainstream and changing the way we work, travel, and live.

Improving automation and artificial intelligence will likely see nearly half of existing US jobs eliminated over the next two decades. While automation was expected to disrupt blue-collar jobs, breakthroughs in machines learning to find creative solutions have also resulted in robots increasingly replacing white-collar careers. The potential impact is unknown. The breakthrough in automated, driverless vehicles provoked the US Department of Transportation's to implement consistent laws across states to prepare for driverless vehicles in its 10-year, \$4 billion plan. Over the next decade, automation of personal life will increase as wearable and implanted technology connects consumers to the 'Internet of Things', which encompasses smart homes, smart grids, and intelligent transportation systems.

Relevance

- Oil and gas sectors will look to increase automation of the workforce and operations to reduce costs.
- The adoption of driverless vehicles and public transportation fleets may have an impact on urban planning, driving behaviour, vehicle ownership, and associated transportation fuel demand trends.
- Smart grids could maximize the potential of intermittent energy from renewables. Greater uptake of smart grids may impact expectations for natural gas in electricity markets.

Energy and climate long-shots - Global

As the global population looks to protect environmental health, innovators are increasingly looking to nature to reshape energy challenges.

Once considered gambles, high-risk-high-reward energy sources are increasingly being explored. Researchers are turning to organic life for inspiration with experiments into climate change mitigating geoengineering, high-altitude 'tall wind' and even the use organic compounds to develop high-performance batteries and chemical feedstock from

fruits and vegetables. Additionally, the research from biomimicry and biophylic design is increasingly being applied to the field of energy. Yet, the innovation Holy Grail continues to be safe, cheap, and efficient fission reactors that are portable, prefabricated, and able to provide abundant energy with minimal emissions.

Relevance

- Breakthroughs in fission energy or other ‘gambles’ could dramatically affect the speed of a global transition away from fossil fuel products.
- There is no corresponding royalty regime for these potential energy sources. If they become viable options within our energy system, they will initially be operating outside existing rules and regulations.
- These innovations will likely push future use of energy towards options which are networked, distributed and modular.

Next generation oil and gas - AB

Oil and gas extraction are set to become more efficient, economic, and environmentally friendly.

Globally, new technologies such as next-generation enhanced oil recovery, seismic imaging, and the digitization of operations could increase recoverable oil and gas resources by 35 per cent and reduce costs by as much as 25 per cent by 2050. In Alberta, innovation efforts have coalesced around more efficient and cleaner ways to extract bitumen. On the near horizon, advances in electrical conduction, solvents, and microwaves could replace water and natural gas in the extraction process, with the potential to green oil sands production.

Relevance

- In order for oil sands extraction to make significant technological leaps, government will need to take on a greater role in enabling transformative innovation.
- Alberta could become an innovation hub for extractive technologies, driving further advances in unconventional resource production.
- New extractive technologies have already alleviated concerns around peak oil and may unlock reserves that introduce new competitors and change market dynamics.

Environmental

Environmental capitalism - Global

Pricing of carbon is increasingly being used to encourage industry to account for costs to the environment.

Triple-bottom-line accounting is a framework to assess business value and cost in three parts: social, environmental and financial. The increasing adoption of this concept represents a growing awareness in academia, public consciousness, and the green business community, of the need to account for environmental externalities. A price on carbon is a major component of environmental capitalism, highlighting the potential that carbon could come to be viewed as a commodity as industry shifts their thinking from carbon as waste to something that can be sold.

Relevance

- The existence of an explicit carbon price may affect business accounting practices and alter decision-making criteria for investment decisions in carbon-intensive industries in Alberta.
- Low-carbon industries will become more competitive in the presence of a carbon price.
- Alberta could have “first mover advantage” if it pursues the innovation required by businesses to find alternative means to access and generate energy.

Drive towards Near-Zero-Emissions Vehicles - Global

There is a modest but growing market for near-Zero Emission Vehicles (ZEVs) including battery-electric, plug-in hybrid (PEVs), and fuel cell (hydrogen) vehicles.

The market for near-ZEVs is anticipated to grow as a shift from internal combustible engines has been encouraged by some government policies in order to meet emissions targets in the transportation sectors. Increasingly companies are investing in new technologies like improved charging capacity and battery life in higher-end ZEVs. However, while near-ZEVs are strong in some markets, growth has fallen below global expectations. Lower fuel prices for traditional vehicles, paired with the perception of near-ZEVs as a novelty option, has dampened sales growth.

Relevance

- The market for near-ZEVs is anticipated to grow, but will be strongly influenced by affordability, fuel prices, charging infrastructure and government programs over the short to medium term.
- Moderate to significant adoption of near-ZEV will not eliminate fossil fuel dominance in the transportation sector, but could precipitate a significant structural shift in demand.
- Near-ZEV will be concentrated in the Light-Duty Vehicle market, which relies on low-sulphur diesel power. There will be little penetration into the commercial Heavy-Duty Vehicle market (e.g. trucking, rail, and shipping), which is where Alberta’s crude is largely used for creating heavy duty diesel.

From peak oil to peak demand - Global

Oil demand has not kept pace with supply. Anemic global growth coupled with potential structural changes due to climate action, and clean energy technology, may increase a sense of fossil fuels uncertainty.

Within the span of a decade, public discussions on energy have shifted from running out of oil to the low-carbon transition. Major technological breakthroughs have unlocked previously uneconomical reserves as well as lowered the cost of renewable energy. In addition, clean and affordable energy choices by a climate-conscious population in developed nations are enabling action towards the low-carbon transition. Globally, government policies are initiating trajectories to enable this transition.

Relevance

- Uncertainty over the long-term investment climate (considering climate change, price volatility, and transition to a low carbon economy), may incentivize investors towards faster payback opportunities.
- The window of opportunity for expanding oil development in Alberta is shrinking, given the high capital and operating costs in the province, as well as the potential for peak demand.

Growing need for well reclamation - Alberta

There will be an increasing number of well sites needing to be reclaimed.

Growth in Alberta's oil and gas industry has resulted in over 50,000 abandoned wells in need of reclamation. While reclamation responsibility falls under the purview of oil companies, work is lagging as many companies opt to pay landowners' annual compensation instead of undertaking expensive reclamations. Compounding matters, lower oil prices have triggered a series of bankruptcies in Alberta, resulting in an increase in "orphaned wells". The Orphan Well Fund is seeing a growing backlog of wells, as a precedent-setting judicial decision has granted creditors' priority over the regulators to access liability funds to address and reclaim abandoned wells.

Relevance

- A backlog of orphan wells will test the robustness of the Orphan Well Fund. The provincial government may be left to pick up the tab for reclamation costs, as well as payouts to landowners for rents they are owed by bankrupted companies, if alternative arrangements cannot be found.
- More stringent deductibles for companies' liabilities on abandoned wells could make it difficult for junior companies to enter or survive in Alberta's market, especially during low price periods.

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Economic

Investments in alternatives and renewables are outpacing fossil fuels - Global **Major players are positioning to capitalize on the growth of low-carbon energy sources.**

Investment in renewables and affordability in fuel switching away from oil is usually correlated with a drop in oil prices; however, this is not currently the case. Cost declines and technology breakthroughs have enabled developed countries to undergo an expansion of renewable infrastructure. Venture capitalists, supermajors, and governments are increasingly investing in renewables to hedge and diversify their portfolios and spur clean growth.

Relevance

- As countries begin a transition to lower carbon energy resources, they may increasingly look to renewables instead of cleaner burning fossil fuels.
- A supply and demand gap due to cuts in upstream investment could create an uptick in oil prices over medium-term, increasing the attractiveness of renewable generation in a higher price environment in the longer-term.
- Alternative fuels infrastructure will be the limiting factor on the rate and scale of adoption of near zero emission vehicles.

Shrinking investment timeframes for oil - Global and Alberta

Industry may be preparing for a “lower-for-longer” oil price scenario with diminishing tolerance for longer-term risk.

Since 2014, \$380 billion worth of oil and gas projects have been cancelled globally. In Alberta, oil companies are positioning for near-term futures without major growth projects. As companies change investment portfolios, cost pressures, access to capital and industry consolidation may drive investment decisions. Capital may gravitate towards lower risk producing regions with shorter payout periods.

Relevance

- As oil sands operators shift from growth to maintenance with limited prospects for new major projects, companies may look for growth opportunities outside Alberta.
- Industry consolidation may shift in focus in Alberta and globally as companies seek to divest production portfolios away from long-term oil sands projects in favor of exploiting existing and complementary assets.
- A lower-for-longer price scenario will put marginal producers in Alberta at the highest risk of going bankrupt or being taken over by other companies.
- A continued stagnation of crude oil prices in Alberta will likely intensify calls for the diversification of Alberta’s economy and revenue sources.

Uncertain value of oil sands in a carbon-constrained world - Alberta

Trends to reduce GHG emissions, changing energy consumption patterns and alternative energy systems are converging in a way that may fundamentally alter the energy market.

Economic volatility and prospects for a potentially carbon-constrained world have led some investors to move from investments with long-term returns and increasing risks of stranded assets. With emission policies commitments, technological breakthroughs, and lower prices, Alberta’s energy sector will face increasing competition. Given the large investments required for oil sands growth and the high cost of operations, it is unclear how competitive the oil sands will be should market constraints persist over the long term.

Relevance

- In the short term, Alberta’s competitiveness will continue to be contingent on factors like gaining access to markets, attracting investment, containing inflationary pressures, and relations with First Nations.
- Long term considerations for Alberta’s oil sands include enabling innovation to drive down cost, decarbonizing production, exploring alternative uses, and considering the overall marketability.

- Early adoption of climate mitigation practices and land-use plans (e.g. tailings) by Alberta oil and gas operators could improve the overall reputation of Alberta oil in those international markets that are or become climate-conscious.

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Political

OPEC: A cartel no longer - Global

Schisms within OPEC and fundamental policy shifts by Saudi Arabia are challenging the future ability of the cartel to act as a price-setter.

Growing production from competitors has convinced Saudi Arabia (OPEC's largest producer) to abandon its traditional strategy of price defense in favour of a market-based approach. OPEC has followed suit, but the decision is facing stiff internal opposition from Iran and non-Gulf states. Rivalries within OPEC have blocked any compromise on the resumption of some form of price defense and this is likely to continue for the near future. It remains to be seen whether OPEC's shift away from price defense will survive the financial toll of low oil prices on its member states or if Saudi Arabia continues to exert pressure on the organization by "going alone".

Relevance

- Exporting nations will no longer be able to rely on OPEC to be a price stabilizer, and without a reversion of OPEC's current policy, price recovery may be slower than anticipated.
- Without a shift in OPEC policy, any price recovery will likely be due to planned developments in non-OPEC countries being shelved, particularly in Alberta.
- There may be increased competition from other exporting nations, including the US, spurred on by the drive to produce and compete in a low-price market.

Climate change as the new normal - Global

A growing global response to climate change is shifting the political landscape for energy development and use.

The emerging reality of increasingly volatile weather patterns and severe events is driving a global response to climate change. From international events like the 2015 Conference of Parties 21 in Paris, to alliances between jurisdictions to accelerate the adoption of electric cars, a growing political consensus around climate change as the "new normal" is taking hold. More and more, climate change is not solely a technical issue, to be resolved by scientists, but a political issue with political implications at all levels of governance. Political agendas advancing climate change initiatives such as carbon levies and market mechanisms are driving the creation of legislative and economic frameworks for low-carbon and renewables that could better enable these energy sources to compete against non-renewables.

Relevance

- Climate change is increasingly present as part of political dialogue and may become increasingly incorporated intergovernmental and international agreements as standards relevant to Alberta exports and trade.
- Political direction on climate change may have implications for how extractive industries choose to make investment decisions, as business models look to climate change as a financial liability or market opportunity.
- Governments at all scales may need to grapple with how to address a future international norm on climate as part of policy and strategy.

Coal mined in Canada but burned elsewhere – Global and Canada

As developed nations shift to "green the grid", the use of coal may now take place further from its extraction sources.

Both Ontario and Alberta have made significant announcements to cut coal from their energy mix. With the power industry in Alberta having spent billions building new coal-fired plants in the last decade, these industry players may demand a return on their capital investment if legislated to close before the end of the facility's

lifespan. Where coal faces strong policy constraints in developed economies, some emerging markets - notably India and Southeast Asia - will see a tripling of coal demand and potential opportunities for exported coal.

Relevance

- The phase out of coal provides the ability to meet Alberta's Climate Leadership Plan and may increase opportunities for natural gas production for power generation and petrochemicals.
- There may exist opportunities to export Alberta coal to East Asian markets.
- Coal-dependent communities will need to assess their viability and options given the looming shut down of their coal mines.
- Unless the costs of carbon sequestration become more competitive, the push to cut GHGs may establish natural gas as a transition fuel towards low-carbon energy generation.

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Sources

Forecasts

Growing global energy demand

Estimates depend on forecasting organizations. For example, the International Energy Agency expects a 32% increase from 2013 to 2040 (World Energy Outlook 2015, p. 55);

The US International Energy Administration a 48% increase from 2014 to 2040 (International Energy Outlook 2016);

British Petroleum a 37% increase from 2013 to 2035 (BP Energy Outlook 2035, p. 11); Exxon Mobil a 25% from 2014 to 2040 (Outlook for Energy: A View to 2040, p. 11).

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Fossil fuels to remain dominant energy sources

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Industrializing countries drive global energy growth

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