

Guide to Renewable Energy and Battery Storage Projects

How Alberta landowners can reap the
benefits of hosting clean energy



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2025

Jason Wang

PEMBINA
Institute

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We also appreciate the input and feedback from landowners, developers, and government and academic experts.

The Pembina Institute recognizes that the work we steward and those we serve span the lands of many Indigenous Peoples. We respectfully acknowledge that our organization is headquartered in the traditional territories of Treaty 7, comprising the Blackfoot Confederacy (Siksika, Piikani and Kainai Nations); the Stoney Nakoda Nations (Goodstoney, Chiniki and Bearspaw First Nations); and the Tsuut'ina Nation. These lands are also home to the Otipemisiwak Métis Government (Districts 5 and 6).

These acknowledgements are part of the start of a journey of several generations. We share them in the spirit of truth, justice and reconciliation, and to contribute to a more equitable and inclusive future for all.

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About this guide

Alberta's sunny skies, abundant wind resources and market-based electricity system have made it a national leader in building renewable energy projects in recent years. These developments bring local community benefits like lease payments, tax revenues and jobs.

Despite ongoing policy and regulatory uncertainty, private investors are interested in continuing to expand the sector, and most rural Albertans support projects developed in their communities. Still, it is important to ensure that future projects are developed in a way that benefits landowners, communities, and Indigenous nations and rightsholders.

The purpose of this primer is to help landowners and their communities know what to expect from utility-scale wind, solar and battery energy storage project development. It aims to help landowners navigate the entire process, starting from being approached by a project developer or a land agent. It is not meant to replace advice from a lawyer. Instead, it highlights important steps and information that require particular attention during the project development process.

In particular, landowners should know that:

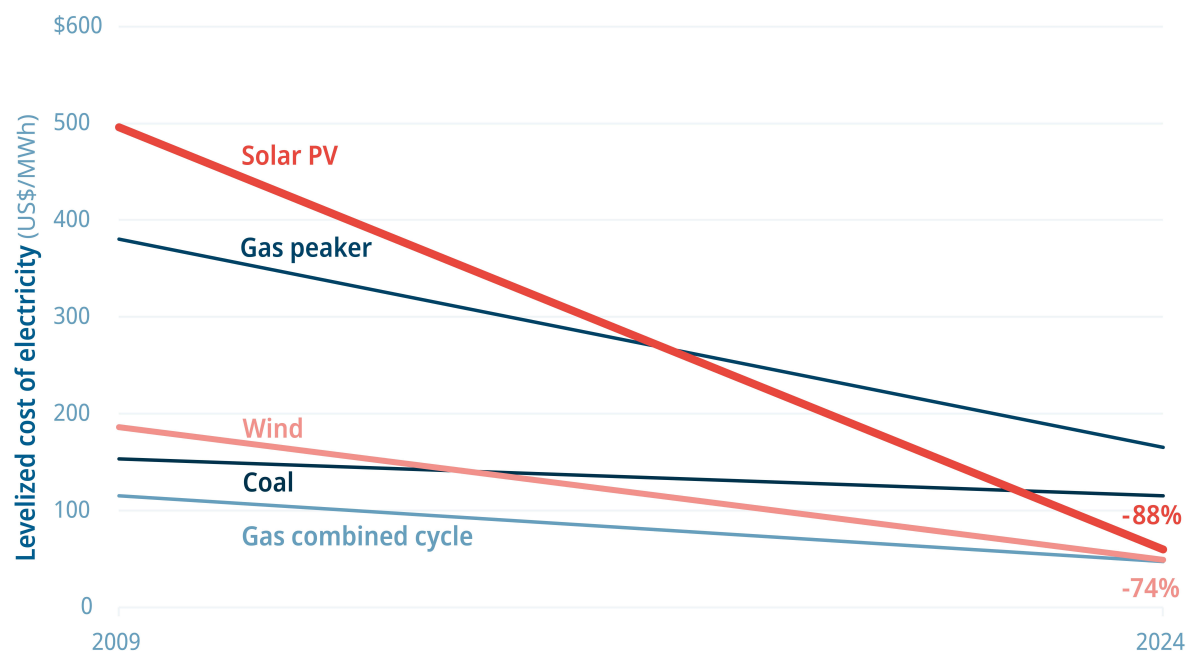
1. Projects can only be developed with landowner permission. Landowner requests are easier for developers to address early in a project and developers should begin engagement as early as possible.
2. Developers should be clear about what they are asking for and can offer, such as potential lease payments and community benefit agreements.
3. A group of landowners together, or with a municipality, can take the lead by proactively choosing to host renewables development. This can be through formal municipal processes or informal coalitions of neighbouring landowners. Demonstrating community support for a project gives communities and landowners better leverage in negotiations because it signals that landowners understand the development landscape and compare offers between different developers that best aligns with their goals.

1. Renewable energy basics

1.1 What is renewable energy?

Due to rapid advancements in technology, solar photovoltaics and wind energy have become the lowest-cost way to produce new electricity. Since 2009, the price of installing a solar panel has fallen 88%, from US\$496 to US\$60 per megawatt-hour (see graph).

With steadily falling upfront costs and low operating and maintenance costs, these resources are increasingly becoming the go-to for electricity grids, industrial and commercial facilities — including farms — and households. Wind and solar projects make electricity more affordable, improve local air quality, and create more energy independence and security, especially when combined with batteries. Utility-scale wind and solar projects are now the key players in reducing greenhouse gas emissions from electricity generation, and battery energy storage is helping to maximize the potential of wind and solar facilities. Companies around the world are looking for more clean energy, and they are choosing to invest in places where the electricity grid is cleaner.¹ Both these investments and utility-scale wind and solar projects create local jobs, increase municipal tax revenues, and create stable, long-term lease payments to landowners.



Wind and solar electricity costs have declined substantially in the last 15 years, compared to other forms of energy generation.

Adapted from: Our World in Data²

Alberta's big, blue skies also mean it has some of the best potential for solar and wind energy in Canada. Alberta sees less cloud coverage and more sunny days than most parts of Canada, even in the winter. With its free and competitive market structure, Alberta has led Canada in wind and solar energy development in recent years. In 2023, 92% of wind and solar built in Canada was in Alberta,³ and in 2024 these renewable projects delivered 19% of all electricity generated in Alberta.⁴ **If this portion grew to around 60%, electricity bills for Alberta families could be hundreds of dollars less per year.**⁵ Three-quarters of Albertans want to see renewables in their community, including two-thirds of Albertans outside of Edmonton and Calgary.⁶ However, this is not to say that all renewables projects should automatically be approved; local support, both informal and formal, is an essential part of any potential development.⁷

1.2 How is renewable energy evolving in Alberta?

In August 2023, the Government of Alberta halted the approval of new renewables projects for seven months and set up an inquiry to develop new rules for the industry. Later that year, Alberta launched an electricity market redesign. Over 2023 and 2024, both the rules governing where and how projects can be built and the electricity market rules they would operate under were amended, with most of the new rules finalized as of September 2025. The new restrictions and market uncertainty have meant lower investment interest and delayed projects — and the development of all new electricity generation in Alberta, including wind and solar projects, has slowed down.⁸

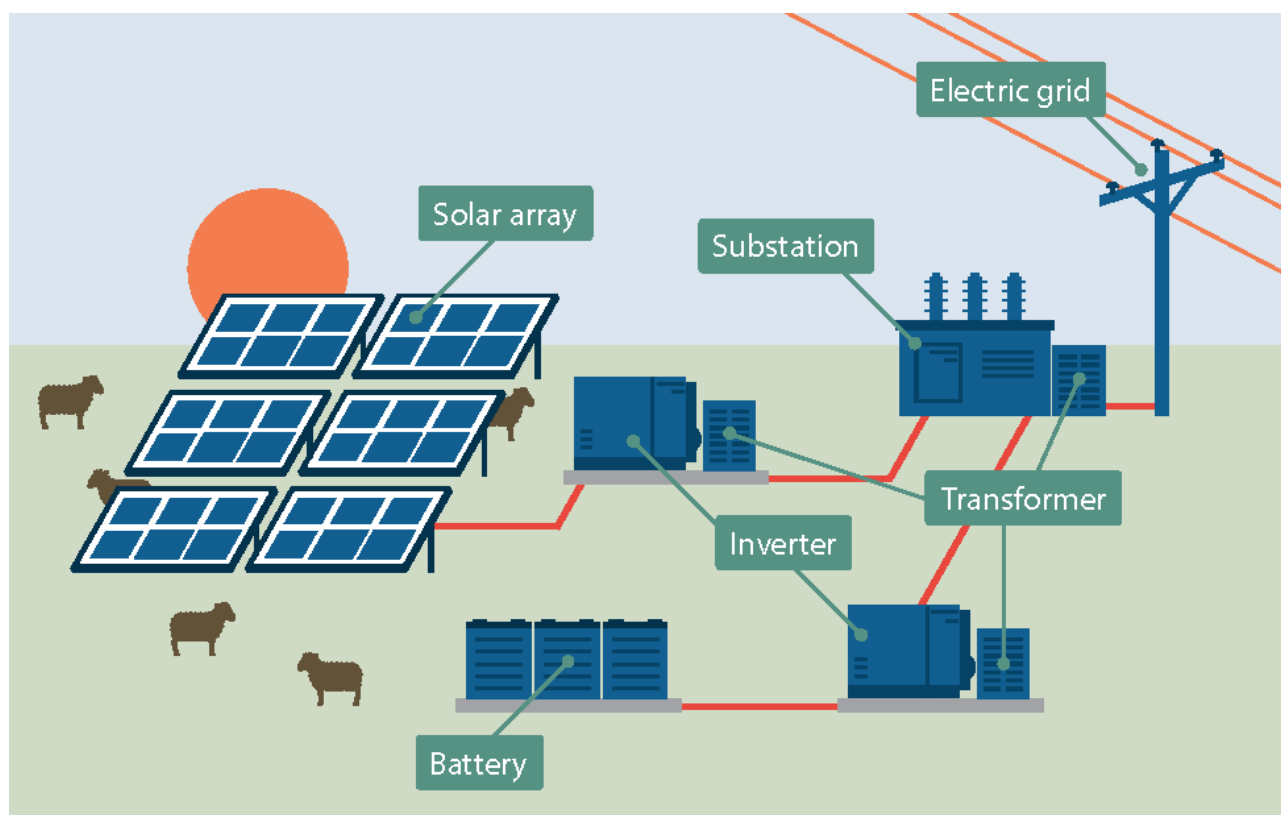
It is still unclear how Alberta's new regulations and electricity market rules will impact the evolution of the grid in the decades to come, but looking ahead, renewable energy and battery storage costs are predicted to drop even further.⁹ New uses and business models are emerging that will continue to change Alberta's landscape, such as combining solar installations and farming (agrivoltaics) or using solar panels to cover barns, canals and parking stalls. Renewable energy and batteries are already outcompeting other electricity generation technologies around the world and as costs continue to decrease, there is every reason to believe renewables will become a larger and larger part of Alberta's electricity system. Alongside hydroelectricity, newer technologies, such as enhanced geothermal energy, small modular nuclear reactors, and long-duration energy storage (i.e., between months or seasons), could one day serve a role in the electricity system, though none of these have been deployed yet in Canada.

1.3 What types of renewable energy projects are being developed in Alberta?

The fastest growing types of renewable energy are solar photovoltaic (PV) panels and wind turbines. Recently, rapid cost declines have also made batteries attractive additions to electricity grids. These provide reliability services, such as helping spread out the use of electricity generated by solar panels, even after the sun sets. Sometimes, these facilities stand alone and other times, they are built as part of a solar or wind facility.

Solar

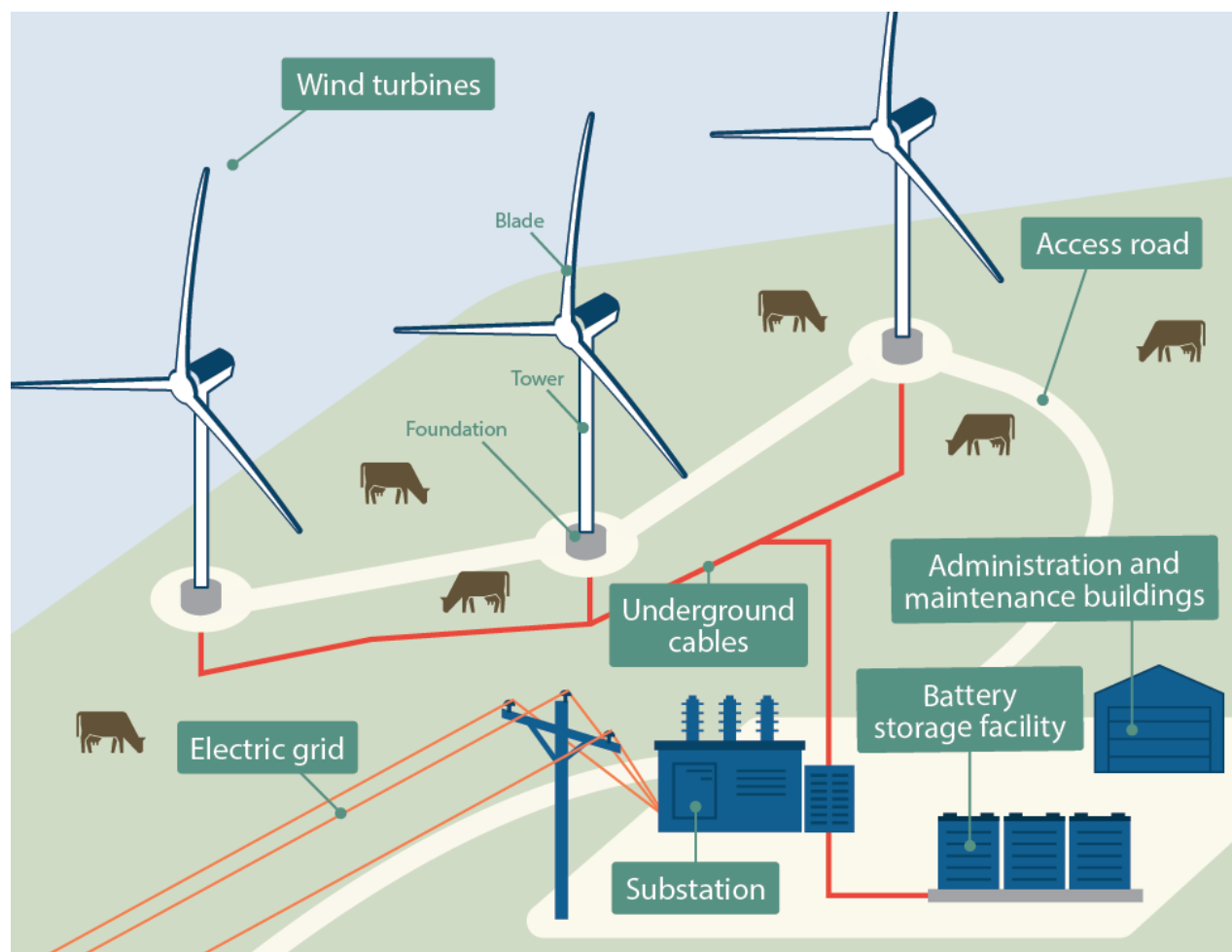
Solar panels consist of energy-generating cells that look like flatscreen TVs mounted in panels of glass, ordered in rows. In Canada they generally face south. Some installations include pivots that allow the panels to track the sun across the sky, while in other facilities, panels that face east or west can capture more morning and evening sunlight without adding the pivot equipment. In general solar systems are tilted to capture as much sunlight as possible in their location at the lowest cost.



Parts of a solar PV installation

Wind

Wind turbines convert rotational energy into electricity. They are most effective when they are taller because there is more wind higher up. A three-blade design with longer blades is best at catching more wind. Wind turbines are located to capture the prevailing winds with as little obstruction as possible, but each turbine can rotate to capture the wind in any direction.



Parts of a wind facility

Energy projects big and small

Renewable energy projects are developed in Alberta under one of two regulatory frameworks: small- and micro-scale or utility-scale generation.

Small- and micro-scale generators are mostly rooftop solar PV panels installed by individuals, small businesses, municipalities and First Nations, or community groups like churches, schools, irrigation districts and co-operatives (see Section 3.1). These facilities connect into their local electricity distribution systems.

Utility-scale projects are much larger ground-mounted PV systems or large wind farms that are connected directly to the transmission system. Innovative ideas are being developed for these; for example, in some places in the world, solar farms are installed over canals and reservoirs to reduce water loss and utilize an otherwise wasted space.

1.4 What are the benefits?

Benefits to landowners

Renewable energy is growing worldwide because of its low costs in addition to its environmental benefits, but it also offers financial benefits for landowners and communities. In fact, many farmers across the world are working with wind and solar energy companies to supplement their cashflows. Land lease agreements will vary by location and technology, but wind and solar projects can result in significant extra revenue for landowners in Canada: public numbers from 2024 and 2025 suggest solar projects can pay \$600 to \$1,200 per acre or \$96,000 to \$192,000 per quarter section each year.¹⁰ Lease payments can be fixed (with adjustments for inflation) and could have variable portions based on the electricity produced, like a royalty. Fixed leases aren't impacted by drought or commodity price fluctuations and can be a stable source of revenue for a landowner, but may be lower in value. A royalty-based approach presents both higher risk and higher rewards for the landowner.

Most utility-scale wind, solar, and battery storage projects have been built in rural Alberta through lease agreements with private landowners. These projects all require full consent and legal agreement of the landowner for the project to proceed. Importantly, this is different to oil and gas subsurface leases, where leaseholders have the right to access those resources on the surface with or without the landowner's consent.¹¹ As a consequence, landowners have the opportunity to negotiate the terms of the use of their land for renewables, such as land lease payments, maintenance and operations, and expectations for reclamation at the project's conclusion.

Benefits to the community

Renewable energy projects pay municipal taxes that fund rinks, roads and other municipal infrastructure.¹² This contribution can be substantial; for example, Vulcan County was able to reduce its municipal residential tax rate in 2023 by 40%, due to the additional revenue brought in by a new solar facility.¹³ In 2024, the Business Renewables Centre-Canada calculated that renewable projects in Alberta brought in \$54 million in municipal taxes. For some counties, this made up a quarter of their revenue.¹⁴ They also found that if all proposed projects as of February 2024 were built, this would bring in another \$277 million to the balance sheets of Alberta's counties, municipal districts (M.D.), and special areas. For certain areas, such as Cardston County, M.D. of Willow Creek and M.D. of Wainwright, this additional revenue would cover more than half their budget.¹⁵

Alongside taxes, many developers have worked with Alberta municipalities to create community enhancement funds. Each agreement differs, but these funds have been used to build bridges for recreational uses like hiking, cycling, and snowmobiling, and to maintain or upgrade hockey and curling arenas. Projects can also create scholarship funds for students.

Taxes from renewables help rural municipalities

"Fourteen Alberta municipalities are collecting over \$1 million annually now in revenues, with the southern Alberta rural municipalities of the County of Forty Mile (\$9 million), Vulcan County (\$7 million) and Municipal District of Pincher Creek (\$4.8 million) heading the list.

For the County of Forty Mile, the millions in tax dollars from wind projects have stabilized municipal tax revenues following a steep decline in oil and gas tax dollars, said reeve Stacey Barrows. The tax dollars from renewables make up about half of its total revenue.

'It helped us to catch back up,' she said."

— *Calgary Herald*¹⁶

Some projects see agreements with landowners and nearby neighbours impacted by infrastructure. For example, some projects in Alberta have:

- Provided electricity bill credits based on how close they are to the wind or solar project (see figure below);
- Included lease payments to residents whose views have been impacted;
- Offered opportunities for landowners to invest in the project and receive a portion of the revenue from the facility.



Electricity bill credit system for EQUUS customers surrounding the Big Sky Power solar project in Lacombe County

Source: EQUUS¹⁷

For a sense of what good developers are thinking about when they engage with communities, the association representing renewable energy developers has published a set of best practices for their members to follow.¹⁸ Landowners should consider these best practices when consulting with potential project developers but should also seek legal advice to ensure they are maximizing their own benefits.

Benefits to Alberta's electricity grid

The electricity from these projects also helps lower the cost of electricity for all Albertans. Because wind and solar projects do not run on fuel, their operating and maintenance costs are very low. The electricity produced from these projects directly feeds into Alberta's electricity grid, providing energy security to the province. In some cases, project operators generate renewable electricity certificates (RECs), which companies across western North America

purchase to offset the emissions impact of their electricity consumption. The revenue generated from selling these RECs goes to the Alberta company running the renewable energy facility.¹⁹

Battery storage facilities balance the supply and demand of electricity and add resilience and reliability to the grid. On a short time scale (milliseconds to minutes), they smooth out variations on the electricity grid because they can adjust their electricity output rapidly. On a longer timeline (hours to even days), they can shift energy from times of surplus to when there is more need, including when emergency events are anticipated. They have already started to protect Alberta from grid alerts. Changes in Alberta's electricity market will incentivize the use of more storage.

1.5 What are the potential impacts?

In response to the growing wind and solar sector, the Government of Alberta and the Alberta Utilities Commission (AUC) launched an inquiry in 2023-24 to change the rules around renewable development. Since then, the Government of Alberta has introduced new restrictions for where solar and wind projects may be located, and mandatory reclamation security requirements.

Some common concerns landowners have about the impacts of wind, solar and battery projects are addressed below.

Impacts on soil and land

If done well, wind, solar and battery storage projects should have little impact on soil. Under the Government of Alberta's wildlife protection directives, projects must minimize soil and habitat "disturbance and fragmentation," including cumulative effects from multiple projects in the region. All proposed projects need to show that they comply with those directives. Developers will usually compensate a landowner for land that must be disturbed.

Modern solar and wind farms typically require minimal grading or topsoil disturbance and can be installed on rolling terrain. The biggest impact to soil from renewable energy projects is from heavy equipment during construction, which can be mitigated through ground protection mats, and from creating access roads. Secondly, solar panel frames require pilings, and wind turbine and battery storage facilities need to build concrete foundations. If precautions aren't taken, there can also be an issue with weeds. Developers should provide proper vegetative groundcover during construction to prevent weeds like kochia and Russian thistle from gaining a foothold on these sites.



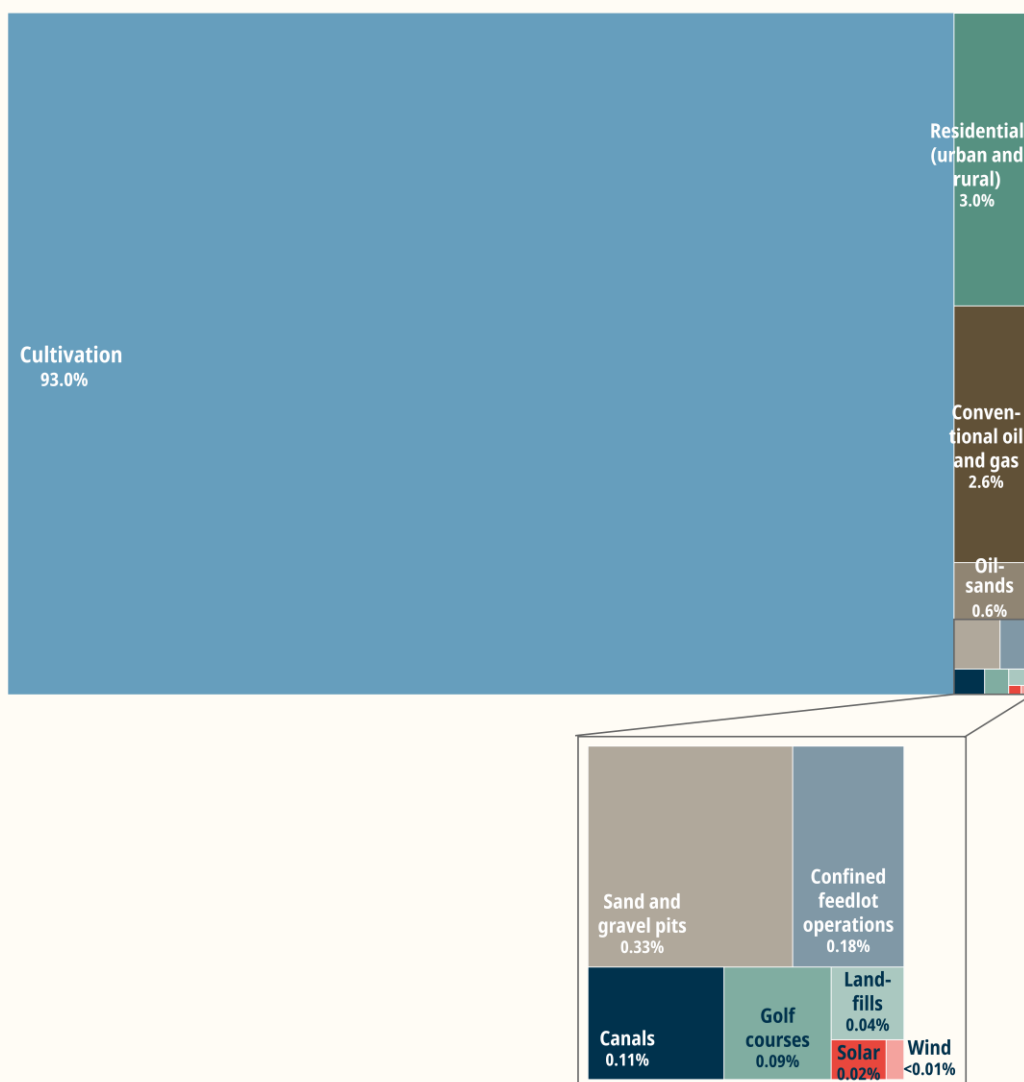
Pilings being installed at Claresholm solar project

Photo: David Dodge, Green Energy Futures

During operation, solar panels cast a shadow on the land they cover. In some cases, this can actually improve the overall productivity of land by increasing water retention in crops and soil. These projects can be combined with regenerative farming practices.²⁰ Several pilot projects in Alberta are studying the further potential of combining solar projects with farming or grazing (agrivoltaics). A University of Alberta project found that spinach plants under solar panels consumed 17% less water and helped cool the panels, improving their efficiency.²¹ The provincial government has also funded a new agrivoltaics research facility at the University of Calgary.²²

Land use by renewables

Though some municipalities have been impacted more than others, renewables have not been a major driver of agricultural land conversion across the province compared with other economic development activity. In fact, industrial sites (including gas power plants), urban sprawl and mines converted 23 times more class 2 land in Alberta's Land Suitability Rating System than wind turbines or solar farms between 2019 and 2021.²³ And as of 2021, conventional oil and gas uses 125 times as much land as solar and wind combined.²⁴ The AUC's inquiry found that the land market for renewable energy projects already favoured non-prime agricultural land and by 2041, would at most impact 0.7% of Alberta's class 2 agricultural land.²⁵ Projects in many parts of the province are also now required to demonstrate that they can co-exist with agriculture.



Land use by different activities in Alberta (not including forests)

Data source: Alberta Biodiversity Monitoring Institute and Copernicus Sentinel Data²⁶

Also, as Alberta landowners have learned from the oil and gas industry's abandoned and orphaned well problem, it is important to ensure that land can be restored or reclaimed when a renewable or storage project is finished. Alberta's new rules require renewable projects (existing and new) to put aside funds for reclamation at the end of the project's life, which can mean tens of millions of dollars for equipment removal and soil reclamation. However, landowners should also know that the context for renewable energy is different than oil and gas.

First and most importantly, because wind and solar energy are renewable resources, project sites are unlikely to be abandoned due to the resource running out. When the hardware has reached its end of life, a high-quality renewable resource will still remain, and it is possible to explore ways to upgrade and/or replace it with newer, more modern equipment. Renewable energy projects have a relatively secure revenue stream over their design life, with many projects having long-term power purchase agreements and/or the ability to see emissions credits.^a As well, if an operating company becomes insolvent, the project would continue to be valuable to creditors or purchasers as there are no fuel costs, and a buyer could purchase the equipment for pennies on the dollar. As there are minimal risks of soil contamination — there are fewer fluids that could spill, for example — site restoration costs are lower, and the scrap value of the metals in the generating equipment can cover significant portions of these costs.

Impacts on wildlife

Alberta is home to over 400 species of birds and bats, with many at risk.²⁷ To protect these species, the Government of Alberta has implemented guidelines for renewable energy development. It also requires continuous monitoring and operational adjustments after a project has been constructed.²⁸

According to the Government of Alberta, the highest risks are to over-wintering birds (especially raptors) and bats, and birds during migration. Alberta's wildlife protection directives prohibit projects around wetlands, lakes and other sensitive areas. They also require surveys, especially during key migratory periods; raptor nest searches; and other assessments for threatened habitat and or species of concern.

Research into causes and options for reducing wildlife collisions with wind turbines is still emerging. Some promising proposals include installing acoustic deterrents or reducing the amount of turbine use during times of lower wind speeds, when bat migration is more likely.²⁹

The requirements for wind and solar energy projects are already among the most restrictive for any kind of development in Alberta. Not all forms of resource development have similar

^a In August 2025, Alberta announced new electricity market rules that could threaten the viability of both existing and proposed renewable energy projects. Operators are still reviewing the full impact of this announcement.

protections for wildlife.³⁰ Renewable energy projects help to displace both air pollutants and greenhouse emissions, both of which impact wildlife. When sited and operated carefully, renewable energy projects can support biodiversity and ecosystem resilience, research in jurisdictions with a longer history of such projects finds.³¹

Impacts on health

The main health impact concerns people have with renewable energy are around sound from wind turbines, and noise and electromagnetic radiation from electricity transmission. The loudness of power plants, including wind turbine blades, is regulated by the AUC based on their distance from nearby residences, roads and special areas.

Noise and electromagnetic radiation have been studied extensively for health impacts other than loudness. To date, no studies have found direct evidence for correlations between noise and any specific human health effects, including from wind turbines.³² In 2014, the Stephen Harper-led federal government directed Health Canada to complete a comprehensive study looking at wind turbine noise and related levels of what they describe as “annoyance.” They found that the level of annoyance someone has could impact their sleep, blood pressure and stress.³³

According to researchers at Health Canada, the University of Alberta and findings in the AUC’s inquiry report, annoyance is most related to noise, the quality of engagement between a person and the developer in the project’s development, and to whether a project’s benefits and impacts are clearly articulated.³⁴

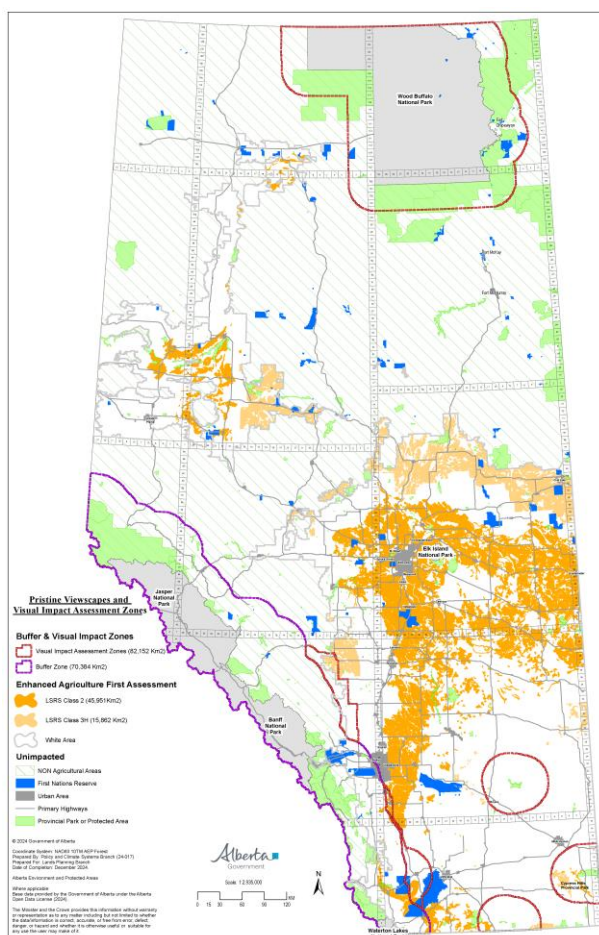
Landowners contemplating hosting a wind turbine might benefit from visiting an existing wind energy facility so they can experience the sounds and sights firsthand. They could invite their neighbours to go with them. Developers may be willing to provide on-site access and tours of existing facilities. Other resources can give a clearer picture of life around wind turbines, like a video measuring noise measurements of wind farms compared to areas near roads and airports.³⁵

Other impacts

Views

Other impacts may be more subjective and could be weighed differently by each individual. For example, while it is universally agreed that Alberta’s Rocky Mountains are breathtaking, some Albertans think that wind turbines enhance that view and others think that they detract from it. In the AUC’s inquiry report, they observed that perception overall depends on a community’s relationship with the project developer. The better the relationship, the better the perception of the project — just like with an individual’s level of annoyance with projects. The AUC also found

limited evidence that wind turbines impact the value of neighbouring properties either positively or negatively.



Exclusion and special assessment zones for wind and solar projects in Alberta

Source: Government of Alberta³⁶

The AUC already requires flicker studies to be done and for developers to address issues that arise. They are also discussing if and how limits should be implemented. Similarly, solar panels can cause glare throughout the day and are prohibited from creating too much glare near airports, airfields and highways.

Infrastructure safety

Lastly, as with all infrastructure, there are concerns about the impact of severe weather on wind turbines and solar panels. In extreme wind conditions, wind turbines will turn their blades away from the wind and lock in place to minimize impact. Permanent structural damage is rare. In the

Wind projects are no longer allowed to be built within 35 km of Alberta's mountains to protect the viewscape. Other types of electricity projects need to conduct visual impact assessments in these areas, which include simulations of changes in views from important viewpoints. The types of impacts are not specified, but developers are required to reasonably address and mitigate issues such as by screening undesirable views with vegetation. Other areas, like those near the Writing-on-Stone and Dinosaur provincial parks, require visual impact assessments for any proposed electricity project, though the government does not require such assessments for other types of development like buildings, oil and gas wells, or power lines.

Shadow and light

Wind turbines do cast shadows and when the blades rotate, these shadows can cause a flickering effect that will change throughout the day and over seasons.

winter, ice can form on turbine blades and fall off when temperatures rise. If ice formation is predicted or detected, workers are not allowed to approach turbines.³⁷

Because they are close to the ground and contain no moving parts, solar panels are relatively shielded from weather effects. They are built with tempered glass that is hail resistant and mostly unaffected by snow coverage.³⁸



Solar installation on farm in Alberta

Photo: Lee Todd, Pembina Institute

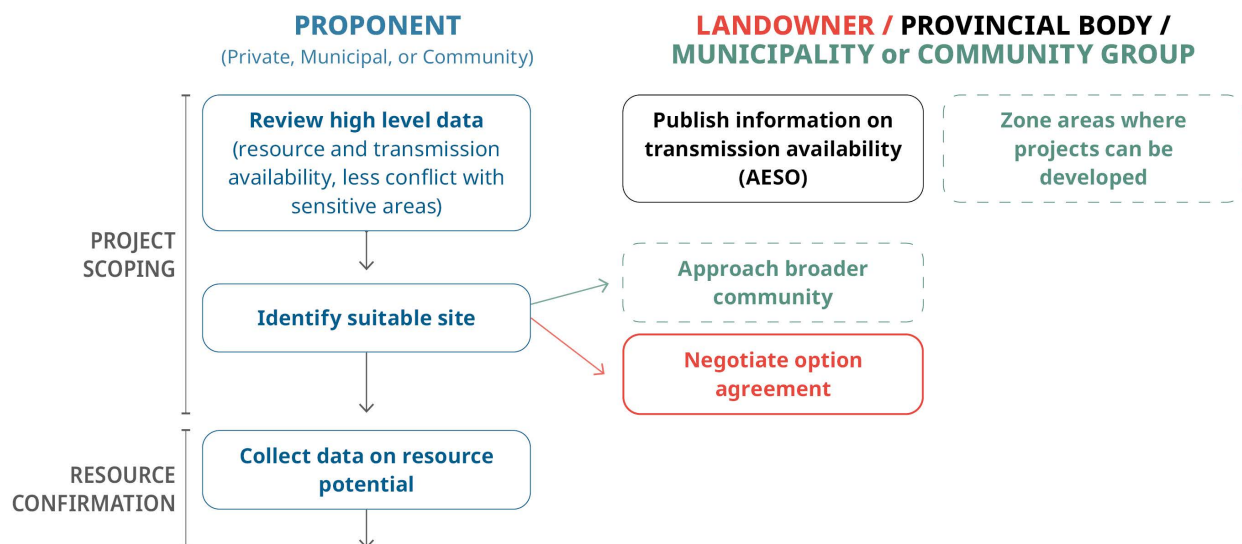
2. Steps in developing a renewable energy project

Developing a renewable energy or battery storage project requires years of study, engagement and permitting. This section provides landowners with an overview of key steps in the process. For further information, Appendix A contains a specific list of questions that a landowner may want to ask developers and Appendix B contains a complete diagram of the development process.

The two most important things for landowners and communities to know are:

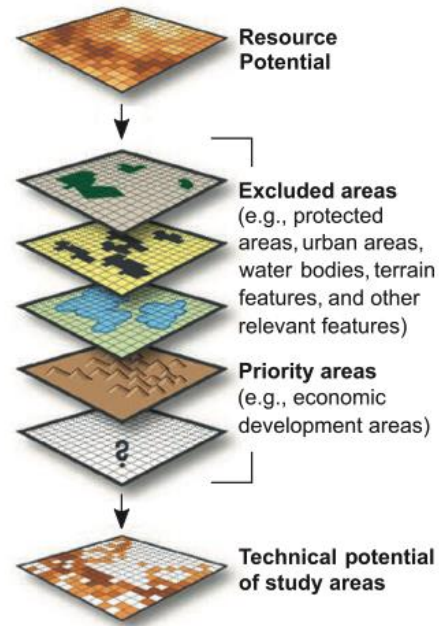
1. Try to engage with the developer as early as possible. Ask questions and bring up concerns. The better the feedback a project receives, the more the developer can shape the project to fairly benefit everyone.
2. If you are entering any agreement with a developer, seek legal advice.

2.1 Finding a suitable site



Alberta's private electricity market structure means that project developers can propose projects throughout the province.^b They typically start with a map of solar and wind resource potential and select the areas with the best resources. Then they look for proximity to electricity transmission infrastructure and availability in capacity. They screen out protected or environmentally sensitive areas and find counties that are interested in attracting investment. When they find suitable land, they work with a land agent to engage landowners who are interested in negotiating a lease agreement.

Then, developers need to collect real, on-the-ground data for wind and solar potential for several years to prove that the location has the resource potential that preliminary maps indicated. This verification is needed to confirm to investors in the project that the project will be economic. **To gain access to the land for data collection, the developer usually signs an initial contract with landowners** (often called an option agreement), which usually lasts three to eight years. The contract may be extended, converted into a long-term lease, or discontinued after it ends.



Renewable energy site selection process

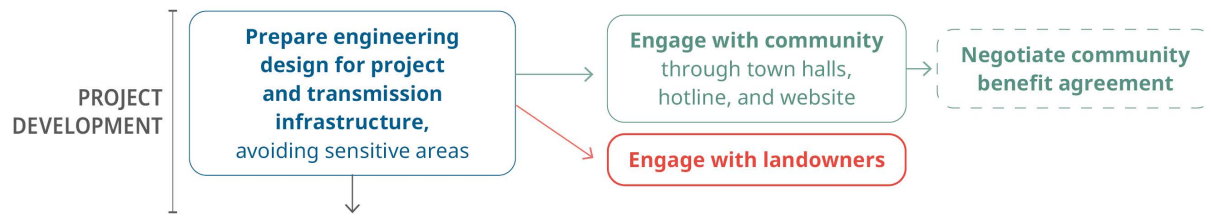
Source: NREL 2017, adapted from NREL 2016

Beyond generating revenue from Alberta's electricity market, most projects in the province also have a power purchase agreement with an electricity customer, like a data centre or industrial facility. Such an agreement provides long-term revenue certainty for the project and assures landowners and financiers that their lease or financing payments will be made. Financing for renewable energy and energy storage projects in Alberta usually comes from banks, private equity, and community groups. Some innovative projects may also receive provincial or federal government grant funding.

Beyond a land lease and good resource potential, investors need policy and regulatory certainty, which includes community support, to make final investment decisions. With many municipalities and provinces inviting renewable energy development, developers will prioritize the locations where they are most welcome and have the best odds of success, to reduce the risk they spend a lot of resources developing a project proposal that does not go ahead.

^bAs of 2025, Alberta does not lease Crown land for wind and solar projects, but is promising to host an engagement process in Fall 2025 to potentially do so.

2.2 Engaging landowners and the community



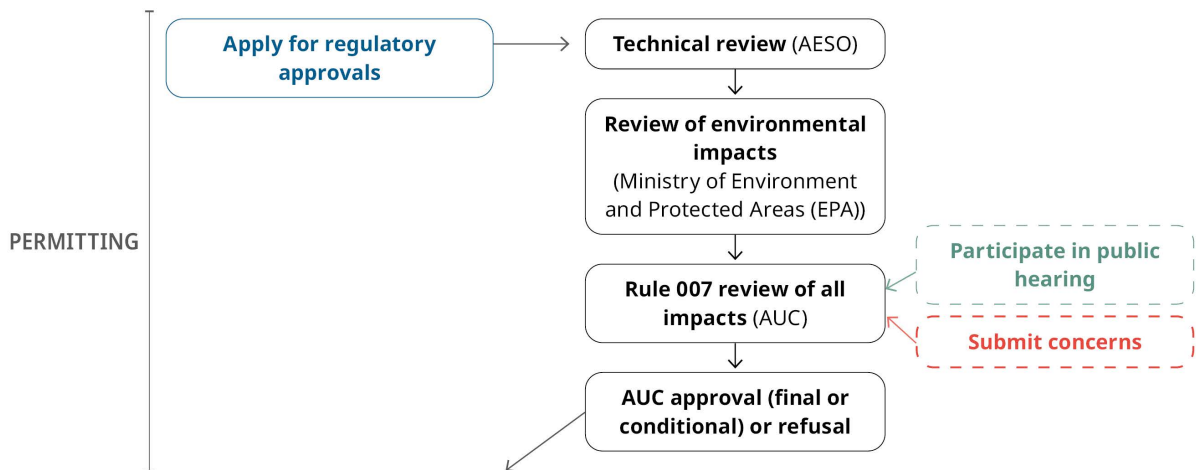
If data collection confirms resource potential, developers will begin their engagement with the broader community. Many aspects of proposed projects can change at this stage, and developers understand that community support is key to their project's success. They should seek to understand and address local concerns on all aspects of the project. **This is an important step for landowners, neighbours, other community members and elected representatives to participate in** and shape the project, including its size, final locations, and the terms of benefits to everyone in the community.

Developers will have engagement teams that reach out to the community through letters or brochures, roadside advertisements, Facebook groups and other channels. They will often run town halls and open houses to explain their proposals and receive feedback from the community. Each project will likely have its own website with information to share, including key contacts.

Having commitments in writing is important and developers need to show the AUC during the approval process (see Section 2.3) what they have committed to do, which may be in the form of a community benefit agreement.

Solar and battery energy projects should also involve local volunteer and professional fire departments. Extinguishing fires at these facilities requires specific training and tools.

2.3 Getting approval



The next step for developers and investors is to obtain regulatory approvals from several government departments and regulators. A new wind, solar or battery energy storage project is primarily governed by the Alberta Utilities Commission (AUC), a quasi-judicial entity that is the main regulator for electricity, gas and water utilities. Through what is called the Rule 007 process, the AUC determines if a project proposal is sound, has sufficiently consulted with key groups, and aligns with the public interest. It also manages conflicts between parties through public inquiries and proceedings.

However, before projects are submitted to the AUC for approval, the first regulatory step is to obtain approval from the Alberta Electric System Operator (AESO). The AESO is in charge of maintaining the reliability of the province-wide electricity grid, which includes planning and proposing transmission lines to connect projects. Developers register project proposals with the AESO and then work through increasingly detailed engineering assessments to refine the technical aspects of those proposals, including transmission needs and impacts to the grid's reliability. Each assessment also comes with increasing costs for developers to demonstrate their seriousness. Not every proposed project makes it to construction.

One other major approval needed for projects is from the provincial Ministry of Environment and Protected Areas. The AUC's Rule 007 requires projects to meet environmental standards including the province's directives for protecting wildlife, wetlands, fish, and historical resources. Rule 007 also requires details about reclamation plans.

Depending on the type of project, further studies might be required to examine:

- Impacts of flickering wind turbine shadows or glare from solar panels (on residences, businesses, institutions, roads, and aircraft pilots)

- Environmental impacts to terrain, soil, water (above and below ground), wetlands, vegetation, communities, wildlife, air quality, or sensitive areas
- Interactions with municipal, provincial, and federal land use plans or airports and aerodromes
- Noise impacts to residences within 1.5 kilometres, regardless of what source they come from (e.g., wind turbine blades or transformers).

The Rule 007 application process usually finds issues that require mitigating. For example, wind turbines and solar panels might need to be sited differently. Developers may need to specifically protect sensitive areas and plant vegetation to minimize visual or auditory disturbances.

Developers must demonstrate that they have conducted meaningful engagement with landowners who are affected either directly or indirectly. If the developer does not adequately address issues, **affected landowners can submit their concerns to the AUC directly** and may even be eligible for funding for participating in the review.³⁹ During the review, the AUC may reject a project altogether. More often, the AUC will conditionally approve projects, explicitly noting which issues must still be addressed and how.

Recently, in December 2024, the Government of Alberta introduced new restrictions limiting new wind energy projects from no-go wind zones to protect “pristine views” and requiring visual impacts in other zones designated by the Ministry of Affordability and Utilities (see map in Section 1.5).⁴⁰ Solar projects are now also excluded from Class 1 and 2 agricultural land throughout the province and Class 3 lands in 10 counties^c unless they can demonstrate an adequate level of coexistence between the project and agricultural activities.⁴¹ Municipalities are also now able to automatically participate in AUC hearings for proposed projects.

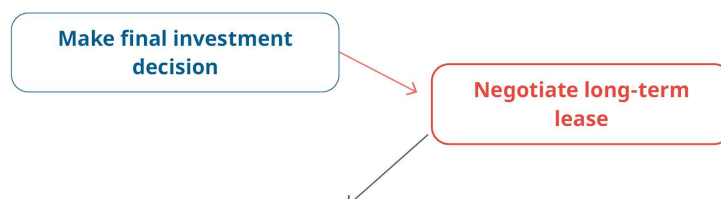
Provincial bodies that regulate renewable energy development

Organization	Role
Alberta Utilities Commission (AUC)	Regulator; adjudicates all applications
Alberta Electric System Operator (AESO)	Electricity system operator ensuring projects are technically compatible with the electricity system
Ministry of Environment and Protected Areas	Environmental and wildlife assessments
Ministry of Affordability and Utilities	Governance, providing direction to the AUC and the AESO; not directly involved in individual projects

^c A detailed list is available in the Electric Energy Land Use And Visual Assessment Regulation under the Alberta Utilities Commission Act at https://kings-printer.alberta.ca/documents/Orders/Orders_in_Council/2024/2024_368.html

Farmer's Advocate Office (FAO)	Provides resources helpful to landowners
Land and Property Rights Tribunal	Plays an important role for oil and gas disputes; not available for renewable energy projects

2.4 Reaching an agreement with the landowner



If a project does proceed, the developer will approach the landowner with a lease agreement. To achieve the best outcome, **we recommend landowners:**

- Be open when discussing the proposal with neighbours, especially in sharing what they have discussed with the proponent,
- Make sure all commitments are put in writing,
- Hire a lawyer to review the draft agreement, as these agreements could be in force for anywhere from 20 to 60 years,
- Engage as early as possible, including raising concerns with the project proponent, environmental impact consultants, and the AUC,
- Know your best alternative to a negotiated outcome, or what would happen if the project proponent doesn't cooperate with you, or if you don't cooperate with the developer.

It is important to know that the Surface Rights Act and the Land Agents Licensing Act do not apply to renewable energy projects because they are situated on private land. Therefore, any legal disputes that arise would need to be resolved through litigation. However, transmission lines that connect renewable energy projects to the grid may fall under the Surface Rights Act.

Unfortunately, there is currently no standard land lease for renewable energy used in Alberta that landowners can use directly or for comparison. There are several ways a lease can be structured regarding restrictions, access, compensation, insurance, reclamation, and other matters. Appendix A contains a non-exhaustive list of some lease questions to ask developers and Appendix D includes more resources from various other experts about land leases for renewable energy projects. In general, important aspects landowners should consider include:

- The lease rate should be based on all the land impacted (lease rate per *effective* acre) including access roads or other needs.
- Compensation should increase over time to account for inflation.

- Clearly state how issues and conflicts will be addressed. Specifically, look for indemnification and for clauses that mandate mediation or arbitration.
- The termination and transfer procedures for the contract should be clear, including how costs would be allocated.

The original developer might transfer the lease to a different company to operate the project. The lease may also be signed with the financier of the project rather than the developer directly.

2.5 Constructing the project



Once all permits and agreements are finalized, construction begins. Typically, it will take two seasons to progress from groundbreaking to operation. In preparation for groundbreaking, developers first construct access roads and prepare wiring and transformers so projects can connect to the electricity transmission system.



A turbine blade for Capital Power's Halkirk 2 facility is transported in Paintearth County.

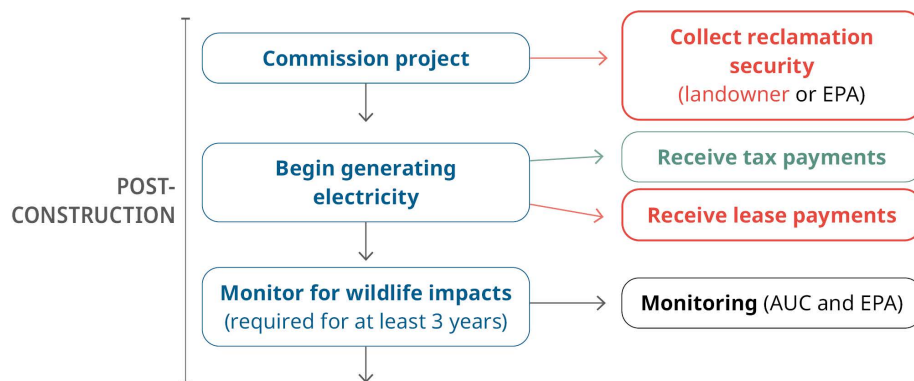
Photo credit: Capital Power

For solar projects, the aluminum racking is installed before panels are put in place. Wires connect the panels to each other and to inverters, which are very similar to neighbourhood transformers (see diagram in Section 1.3). Installation is relatively simple. Developers should provide vegetative groundcover during construction in order to prevent invasive weeds, like kochia and Russian thistle, from overtaking these solar sites.

Wind turbines require more logistical planning. First, a concrete foundation is poured and a steel tower is erected on that. Then, tall cranes place the body (or nacelle) containing the gearbox, generator and electronics onto the tower. Next, the turbine blades themselves — three per tower — are hoisted up and connected to the nacelle. This critical step requires calm weather and so can sometimes cause a small delay in the construction process. Wind turbine components are extremely large and partial road closures might be required to smoothly navigate them from train terminals to the construction sites.

Some communities ask that external workers be stationed locally to further add to the local economy during construction.

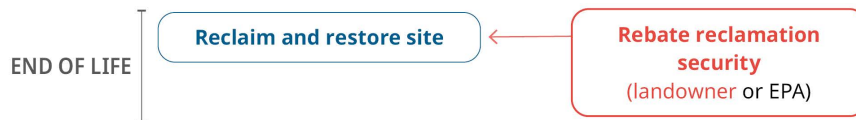
2.6 Operating the project



After a project is safely energized and operational, the developer will need to maintain the facility. The conditions for their access and any compensation (e.g., for any impacts on crops) should be noted in the lease with the landowners. In some cases, the landowner can receive additional compensation by taking on aspects of maintenance of the facility (e.g. vegetation control).

The provincial government, AUC and AESO will continue to provide oversight of operating projects to protect Albertans. For example, AUC's Rule 033 requires all projects to monitor wildlife impact for at least three years, with the possibility of extension, to ensure that any wildlife or environment impact mitigation requirements are working as intended. However, due to lower-than-expected impacts on wildlife from solar projects, in early 2025 the Government of Alberta and the AUC began a review of operational monitoring requirements to minimize administrative burden.⁴²

2.7 Reclaiming the site when the lease ends



Landowners should ensure that their lease agreements require the developer to remove the project and reclaim the land at the end of the lease term. To ensure reclamation can be completed, the Government of Alberta and the AUC introduced new security requirements in June 2025. These rules require developers to pay landowners security for 40% of all liabilities as soon as a project is operational and then for 70% by its 15th year of operation.⁴³ If security is instead paid to the government, 30% is required immediately and 60% in year 15.⁴⁴ The required amount of security does not allow any discounts for the expected salvage value of project components.

Theoretically, almost all of solar panels, racking, and other connecting infrastructure like wires and inverters can be recycled.⁴⁵ The Government of Alberta and the Alberta Recycling Management Authority have been running consultations on how to recycle solar panels. They are considering collecting an upfront recycling fee for solar panels, just like they do for milk jugs and beverage containers.⁴⁶

By weight, 85-90% of wind turbines can be recycled, which is mostly from the metal in their nacelles and the tower. Unfortunately, wind turbine blades are made of fibreglass (like home insulation and canoes) and are harder to recycle, though innovative uses are being found for decommissioned blades.⁴⁷

Reclamation security in context

According to the Business Renewables Centre-Canada, Alberta's reclamation rules are more onerous than those in 27 other jurisdictions in North America, Europe and Australia.⁴⁸ They are also substantially more stringent than those for the oil and gas sector in the province, which have collected around 1% in security.⁴⁹ Issues with oil and gas reclamation was cited as a key reason for the renewables rules to be so tough.

At the end of the lease term, the developer may ask the landowner to extend or renew the lease agreement, since the project will have proven the sun and wind resource potential of that site and the associated transmission infrastructure will have already been built. Modern solar panels are rated to maintain 85% or more of their original efficiency after 25 years, so may be left in place.

A developer may also decide to revamp the site for extended life. Depending on the state of the original solar panels, they may replace the solar panels on the aluminum racks with newer ones and reuse or recycle the existing panels. Revamping a wind project is more involved because wind turbine technology continues to evolve. Larger and taller turbines are more efficient than smaller ones, so a developer may seek to re-engineer their siting and layouts to “repower” a facility, which also creates opportunities for landowners to renegotiate lease agreements. Some of Alberta’s first wind farms, built in the early 2000s, may look to repower too. However, it is still unclear what the procedure might be and what reviews would need to be conducted.



Wind turbine construction in Southern Alberta

Photo: Roberta Franchuk, Pembina Institute

3. How communities can get involved

Renewable energy and storage projects have largely been developed through private development on leased land as described in the previous section. However, there are other ways to involve the community and municipal governments more closely in developing projects.

3.1 Community energy projects

Renewable energy got started in Germany and in Ontario mainly through community projects, such as through local or regional co-operatives,⁵⁰ just as Rural Electrification Associations first brought electricity to much of rural Alberta.⁵¹ Most rural landowners prefer renewable energy projects to be developed this way.⁵² There are several community energy projects in Alberta, but most of these projects are small scale (microgeneration).



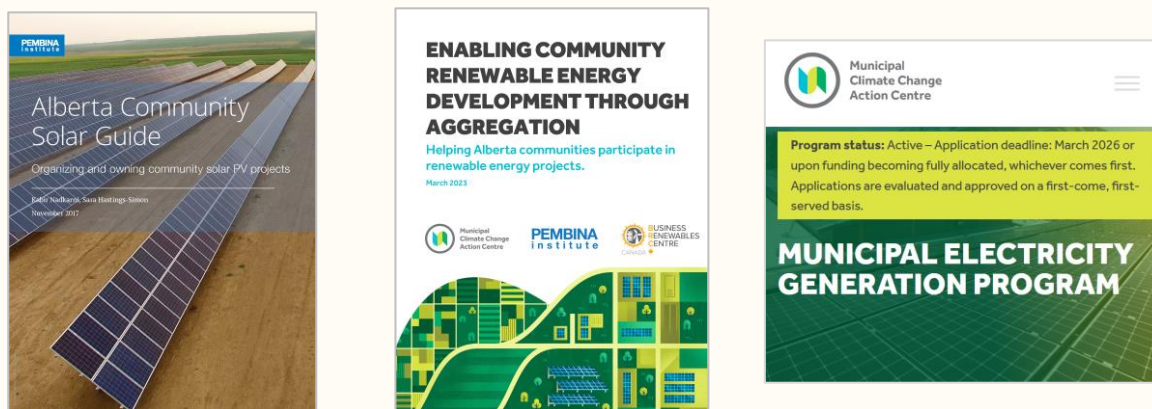
Solar project on Town of Innisfail land

Photo: Roberta Franchuk, Pembina Institute

Since 1994, Irrican Power — a co-operative formed from two irrigation districts in southern Alberta — have built and operated hydroelectricity and solar facilities. They are now planning to develop a battery energy storage project near one of their hydro dams.⁵³

Other irrigation districts and community groups like churches or school boards have built projects, too. The Pembina Institute developed a guide specifically to help with these types of projects (see below). Many of these projects include direct support from municipalities — some of which may decide to become involved themselves, like the Town of Raymond⁵⁴ and Big Lakes County.⁵⁵

Community energy resources



However, these renewable energy co-operatives have generally struggled to scale up like the corporate renewable sector has, facing issues like volunteer burnout and lack of support from politicians.⁵⁶ As a consequence, they have not received substantial political attention. The creation of associations to represent co-operatives, like Community Energy Cooperative Canada, could help to advocate for more policy support for renewable energy co-operatives.⁵⁷

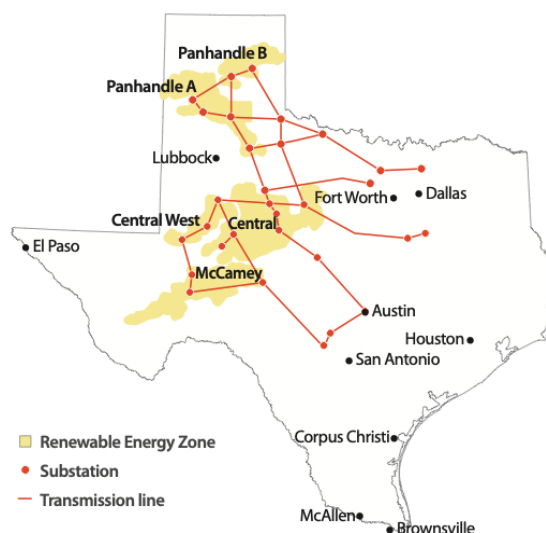
3.2 Competitive zones for renewable energy

As a way to stimulate or diversify their economy, some communities have decided to pursue utility-scale renewable energy. In most cases, the community — whether a municipal, regional, or even state or provincial government — zones a portion of public or private land primarily for renewable energy use. Then, they invite developers to competitively bid with project proposals.

Such an approach lets the communities set terms upfront with aspects like an engagement protocol, tax rates, community benefit funds, requirements to hire local contractors, and more. Developers appreciate opportunities like these because it offers them a willing partner, simplifying the development process substantially.

For example, Sturgeon County offers a 1% tax exemption to solar projects developed on their portion of Alberta's Industrial Heartland. They also set out a minimum size and employment requirement.⁵⁸ At a larger scale, Texas and Quebec have successfully implemented zones like

this, even pre-building transmission infrastructure to windy areas, just as new neighbourhoods might have roads and utilities pre-built to them.⁵⁹ The Township of Clearview in Ontario developed a protocol for engagement and development needed for their endorsement.⁶⁰



Texas established competitive renewable energy zones and pre-built transmission infrastructure

Source: National Renewable Energy Laboratory⁶¹

3.3 Indigenous partnerships

Non-Indigenous landowners and municipalities can amplify their impact to their local communities and economies through partnering with Indigenous communities, many of whom are interested in building renewable energy projects. The above two approaches (community projects and zoning) could also be useful to meaningfully engage with Indigenous partners.⁶²

Increasingly, Indigenous communities are open to sharing a role in the development process and providing financial equity for projects, which may also include developing projects on Reserve lands.⁶³ Having a financial stake in a project is an important way for Indigenous peoples to participate financially, and many nations in Alberta are interested in wind, solar and battery storage projects. For example, the Athabasca Chipewyan First Nation built a solar project in Fort Chipewyan, in Treaty 8 territory, one of Alberta's most remote and northern communities. This enabled them to reduce their use of diesel for electricity generation by 25%. Building on this success, they co-developed three more solar projects in southern Alberta on Treaty 7 land, even adding battery storage with 50% ownership.⁶⁴ In Calgary, the Deerfoot Barlow solar project is owned 51% by the Chiniki and Goodstoney First Nations and 49% by ATCO.⁶⁵

“Clean renewable electricity is now the least-cost option for Alberta consumers. It also helps Alberta meet its climate change goals and is a critical part of ACFN’s business diversification strategy that we will continue to develop.”

— Jason Schulz, Athabasca Chipewyan First Nation (ACFN)⁶⁶

3.4 Innovative agricultural and urban solutions

Many more areas of innovation are possible for renewable energy development in Alberta. Agricultural co-existence is now strongly encouraged by the provincial government and even mandatory in certain areas of the province. For example, agrivoltaics — combining solar panels with agricultural production of some kind, such as cattle or sheep grazing — is mutually beneficial. In a pilot project in the Town of Cardston, Sun Cycle Farms has shown that cattle and solar panels can co-exist.⁶⁷ Yetwood Farms near Travers learned that one of the biggest hazards to solar projects is from grass fires, but sheep reduce that hazard by keeping the grass short.⁶⁸

Solar panels provide valuable shade in agricultural settings, reducing heat stress for livestock and evaporation from crops and irrigation canals.



Sheep grazing under the Travers Solar Farm

Photo: Yetwood Farms⁶⁹

In urban settings, such as in the Town of Raymond, panels over parking lots keep vehicles cool while generating electricity.



Solar panels cover parking stalls at Raymond football stadium

Photo: David Dodge, GreenEnergyFutures.ca⁷⁰

Appendix A. What to ask

Below are a few of the key questions that landowners should ask developers based on the phase of the project. For more guidance, the Government of Alberta Farmers' Advocate Office has a list of common questions and considerations for landowners to know when negotiating leases.⁷¹ The Alberta Environmental Law Centre has also published some tips for landowners specifically related to leases.⁷²

It may also be helpful to:

- Meet the land agent or developer at a time and meeting of your choosing. Bring along a friend or partner to help negotiate.
- Write down all your questions and the responses you receive. Get all commitments in writing.
- Talk to neighbours or other landowners who have projects to learn from their experience.
- Visit existing projects to gather information yourself.

A.1 First questions to ask developers

- Where and what kind of project are you planning to build?
- What level of noise can I expect?
- What types of impacts are you studying or planning to study?
- How much total land will you use for the project and access?
- What do you need to conduct a study?
- What are your proposed lease and lease payment terms?
- How will the project impact my property taxes or insurance?
- Will you work with any community organizations, the municipality, and emergency services?
- How will my neighbours be consulted?
- Are there other landowners with projects on their land who I can speak with about their experiences?
- How many projects have you worked on or operated?
- What other opportunities for input will there be?
- What are the next steps for the project?
- Are you planning to operate the project or to sell it off to another company?
- How will construction be conducted and how long will it take?

A.2 Questions for long-term lease agreements

There is no standard in Alberta for lease agreements between renewable energy developers or their investors and landowners. Overall, **Pembina Institute recommends landowners retain a lawyer** to review and assist with signing the lease. These questions may be helpful:

Lease and project duration

- What is the initial lease period?
- Could the project be extended at the end of the lease period?
- Can we make an arrangement for agricultural co-existence, such as through continued crop production or sheep or cattle grazing?
- How close to the project can I farm or graze?
- What happens to the lease if you sell the project to another developer or operator?
- What happens if I sell my property during the agreement?

Compensation

- Will compensation be based on a fixed rate, variable or some other mechanism?
- Will compensation be indexed to revenue or to inflation?
- How often will I be compensated and what will the mechanism of payment be?
- Are other landowners, who are either directly or indirectly affected, being compensated?
- How will I be compensated if crops or equipment are damaged as a result of the project, such as ice falling from turbine blades or electrical fires?

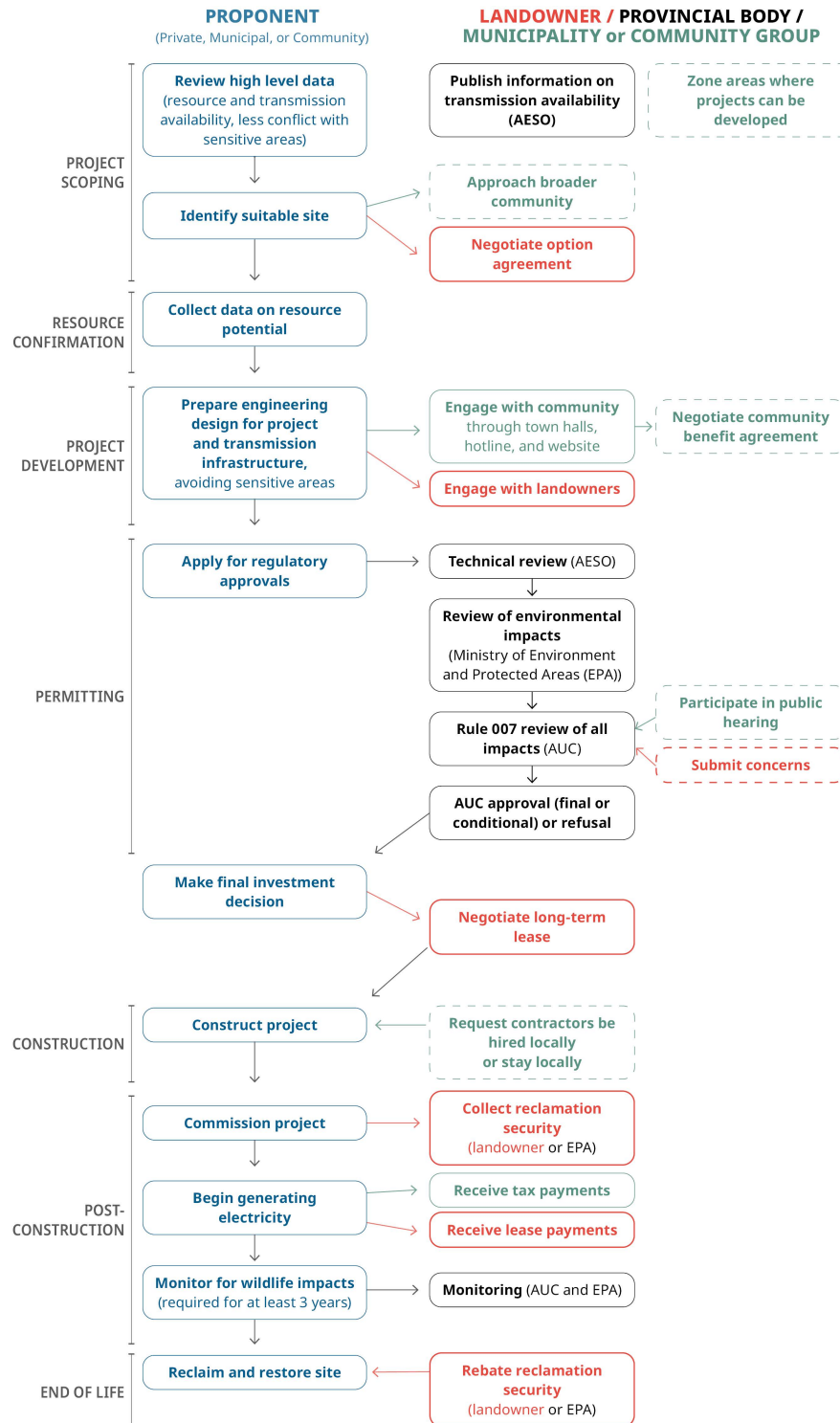
Reclamation and surrender of the land

- Who will be responsible for weed control? Will chemicals be used?
- If the lease is terminated, how will the land be reclaimed? What can you take care of?
- Do you plan to pay reclamation security directly to the landowner, to the Government of Alberta, or some other mechanism?
- What are the decommissioning plans? What state will the land be reclaimed to?

Mitigating damages, indemnity, or defaults

- Who do I contact if I have concerns during construction or once the project is built?
- Who will be responsible for natural and human-caused damages to the solar, wind or battery storage facility?
- How will you work with the local fire department to ensure they're prepared for any issues that might arise from this project?
- What type of insurance will you be taking out to cover the project?

Appendix B. Project development flowchart



Appendix C. Community benefits

Projects can provide a broad range of community benefits, and these can always be negotiated. Some of the agreements in Alberta have included upgrades to recreational infrastructure like pathways, bridges, and hockey arenas.

In the United States, wind, solar, and battery storage projects have supported a variety of interesting benefits:⁷³

- Local infrastructure including broadband internet, recreational parks, trails, and bridges; hockey arenas and curling rinks
- Emergency services including training, equipment, and operations
- Commitments for hiring local contractors and apprentices
- Scholarships and other educational supports
- Public art

Some projects make agreements with landowners and nearby neighbours impacted by infrastructure to provide other specific benefits; for example:

- Providing electricity bill credits based on how close they are to the wind or solar project
- Setting lease payments based on visual impact
- Offering opportunities to participate as an equity owner.

Appendix D. Additional resources

Below are resources written by other experts that may be useful. Note that some of the information they contain may be outdated due to the major policy and regulatory changes that happened in Alberta’s electricity system between August 2023 and 2025.

Rebecca Kauffman, “Here Comes the Sun: Solar Access in Alberta,” *Environmental Law Centre*, September 28, 2021. <https://elc.ab.ca/post-library/here-comes-the-sun-solar-access-in-alberta/>

Farmer’s Advocate Office, *Negotiating Renewable Energy Leases* (2023). <https://ucahelps.alberta.ca/farm/renewable-energy-in-alberta-guide/>

Kabir Nadkarni and Sara Hastings-Simon, *Alberta Community Solar Guide* (Pembina Institute, 2017). <https://www.pembina.org/pub/alberta-community-solar-guide>

Ontario Clean Air Partnership, *Landowner Guide for Wind and Solar Project Development in Ontario* (2025). https://www.cleanairpartnership.org/wp-content/uploads/2025/03/Landowner-Guide_FINAL.pdf

Bennett Jones, “Land Leases for Renewable Energy Projects in Alberta,” November 2, 2023. <https://www.bennettjones.com/Insights/Blogs/Land-Leases-for-Renewable-Energy-Projects-in-Alberta-Update-to-blog-posted-February-2021>

Quick reference for key contacts

Entity	Role	Contact
Alberta Utilities Commission (AUC)	Regulator for all utilities Adjudicates all electricity plant applications	Toll-free: 310-4AUC (4282) info@auc.ab.ca
Alberta Ministry of Environment and Protected Areas	Conducts environmental monitoring, assesses environmental and wildlife impacts	Toll-free: 310-3773
Alberta Electric System Operator (AESO)	Electricity system operator ensuring projects are technically compatible with the electricity system	General inquiries: 403-539-2450
Farmers’ Advocate Office	Provides resources to landowners, like advice on lease agreements and negotiations	General inquiries: 310-3276

Alberta Ministry of Affordability and Utilities	Governs electricity system and provides direction to the AUC and the AESO, but is not directly involved in individual projects	
Land and Property Rights Tribunal	Not available for renewable energy projects	

Appendix E. Endnotes

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- ³ Canadian Renewable Energy Association, “New 2023 data shows 11.2% growth for wind, solar & energy storage,” media release, January 31, 2024. <https://renewablesassociation.ca/news-release-new-2023-data-shows-11-2-growth-for-wind-solar-energy-storage/>
- ⁴ Alberta Electric System Operator, *AESO 2024 Annual Market Statistics* (2025), 15. <https://www.aeso.ca/assets/Uploads/market-and-system-reporting/Annual-Market-Stats-2024.pdf>
- ⁵ Will Noel and Binnu Jeyakumar, *Zeroing In* (Pembina Institute, 2023). <https://www.pembina.org/pub/zeroing-in>
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- ⁷ Drew Anderson, “Wind resistance: meet the Albertans protesting renewables in their backyards,” *The Narwhal*, October 7, 2024. <https://thenarwhal.ca/alberta-wind-energy-renewables-opposition>
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- ¹² Stephen Tipper, “‘Helped us to catch back up’: Municipal tax dollars from renewable energy projects nearly double,” *Calgary Herald*. August 18, 2024. <https://calgaryherald.com/business/local-business/municipal-tax-dollars-renewable-energy-projects-double>
- ¹³ Vulcan County, *2023 Tax Rates & Assessment Information* (2023). <https://www.vulcancounty.ab.ca/document/3585/>
- ¹⁴ Business Renewables Centre-Canada, “Infographic: 2024 Alberta renewable energy municipal tax revenue map.” August 6, 2024. <https://businessrenewables.ca/resource/infographic-2024-alberta-renewable-energy-municipal-tax-revenue-map>
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