



**Otipemisiwak**  
Métis Government

# The Renewable Energy Handbook

Charge up your knowledge  
of solar, wind, geothermal,  
and hydroelectric power!

**Environment and  
Climate Change Team**





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# RENEWABLE ENERGY 101

Citizens who attended our Energy and Climate Change Community Engagement Sessions told us that they'd like to hear more about renewable energy, and we're listening.

Looking for a quick introduction to renewable energy? Start here!

Want to learn more about a specific form of renewable energy? Flip to the Solar Power (p. 4), Wind Power (p. 6), Geothermal Power (p. 7), or Hydroelectric Power section (p.8).

## What Is Renewable Energy?

Renewable energy comes from sources that naturally regenerate faster than we consume them, including the sun, wind, water, and the heat from deep underneath the Earth. This is important because fossil fuels, such as oil, gas, and coal, are used faster than they're formed.

By using technologies like solar panels, wind turbines, geothermal power plants, and hydroelectric facilities, we can convert the energy produced by these sources into electricity and heat. These processes emit fewer greenhouse gases than conventional sources.

## What Are Clean Energy Technologies and Services?

Clean energy technologies and services support renewable energy sources by increasing their regeneration rate, improving energy efficiency, and reducing greenhouse gas emissions.

## Where Does Alberta's Energy Come From?

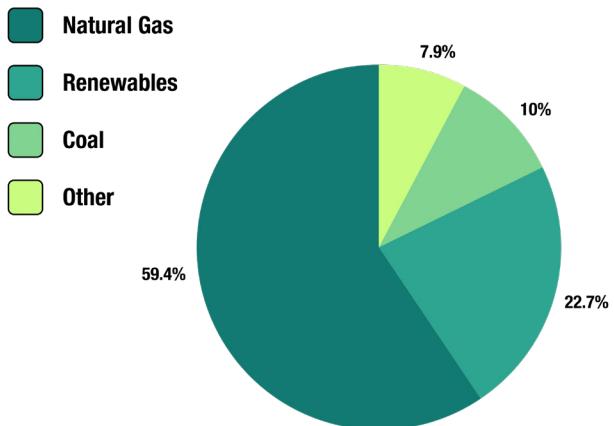
Electricity sources in Alberta are changing fast!

According to the Alberta Electric System Operator's (AESO) 2023 Year in Review, renewable energy accounted for just over 22% of the total energy produced in Alberta in 2023, whereas natural gas was nearly 60% of the province's energy output ([aeso.ca/assets/2023-AESO-Year-in-Review\\_WEB.pdf](https://aeso.ca/assets/2023-AESO-Year-in-Review_WEB.pdf)).

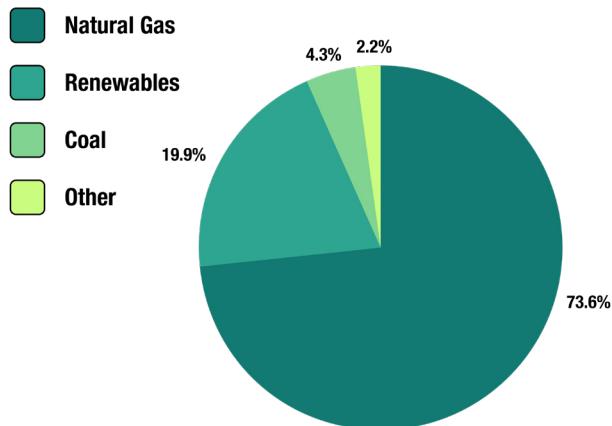
In their 2024 Annual Report, AESO indicates that natural gas accounted for over 73% of Alberta's electricity generation, which is a rise of nearly 24% from 2023 ([aeso.ca/assets/2024-AESO-Annual-Report.pdf](https://aeso.ca/assets/2024-AESO-Annual-Report.pdf)). Renewable energy sources, such as wind, solar, and hydroelectricity, contributed approximately 20% to Alberta's energy output. By June 2024, coal-fired generators were phased out, reducing coal's contribution to the province's overall electricity generation to 4.3%.



## ALBERTA ELECTRICITY GENERATION (2023)



## ALBERTA ELECTRICITY GENERATION (2024)



The “renewables” category includes wind, solar, and hydro. The “other” category includes biomass, waste heat, and geothermal energy, often in combination with natural gas.

### DID YOU KNOW?

- In 2022, 81% of Alberta’s electricity was generated from coal and natural gas and 17% was generated from renewable sources, like wind, hydro and solar ([canada.ca/en/services/environment/weather/climatechange/climate-plan/clean-electricity/overview-alberta.html](https://canada.ca/en/services/environment/weather/climatechange/climate-plan/clean-electricity/overview-alberta.html)). Just two years later, the province had successfully phased out all coal generation, six years ahead of their original target ([alberta.ca/climate-coal-electricity](https://alberta.ca/climate-coal-electricity)).
- According to a January 2024 news release from the Canadian Renewable Energy Association, over 90% of Canada’s overall growth in renewable energy and energy storage capacity was driven by Albertan renewable energy projects (<https://renewablesassociation.ca/news-release-new-2023-data-shows-11-2-growth-for-wind-solar-energy-storage/>).

### What Are the Environment and Climate Change Department’s Sustainable Energy Initiatives?

- **Engagement sessions:** At the Energy and Climate Change Community Engagement Sessions, Citizens told us that they want to learn more about renewable energy, and we’re creating resources to meet this need ([albertammetis.com/energy-and-climate-change-community-engagement-sessions/](https://albertammetis.com/energy-and-climate-change-community-engagement-sessions/)).
- **Salay Prayzaan at Métis Crossing:** Salay Prayzaan is our 4.86-megawatt AC, community-generation solar farm. Its output is equivalent to the power required by 1200 homes.

- **Micro-generation solar:** Located on our sites and buildings, our rooftop or own-use solar systems help reduce greenhouse gas emissions and lower our energy bills.
- **Building Energy Use:** By tracking our building utilities in our greenhouse gas inventory, we can identify ways to reduce our energy use and greenhouse gas emissions through energy efficiency retrofits and energy management.
- **Energy Efficiency Retrofit Program (EERP):** A collaboration with Métis Capital Housing Corporation, the EERP assists Citizens with reducing their home energy use, costs, and related greenhouse gas emissions through funding the implementation of energy efficiency upgrades for their homes ([metishousing.ca/programs/home-programs/energy-efficiency-retrofits/](http://metishousing.ca/programs/home-programs/energy-efficiency-retrofits/)).

## SOLAR POWER

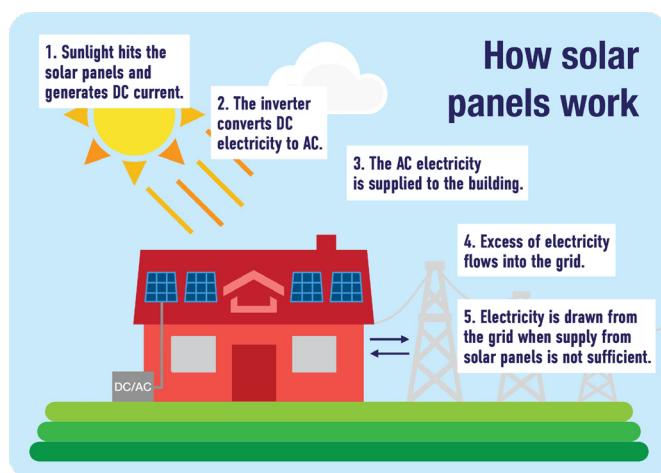
*Solar power refers to electricity or heat that's produced by harnessing the energy transmitted by sunlight, which is also known as solar energy. This section discusses the conversion of solar energy into electricity.*

### Generating Solar Power

Solar panels are one of the ways that we can convert solar energy into electricity.

Also known as photovoltaic or PV cells, these panels convert sunlight, or solar energy, into electricity through a multi-step process:

1. Sunlight shines on a solar panel.
2. The sunlight interacts with the semi-conductor material in the panel, generating a direct current (DC).
3. The direct current (DC) is converted to an alternating current (AC) by an inverter.
4. The alternating current then directly powers homes or businesses, is put into the grid, or is stored by a battery system for later use.



### Solar in Your Life

A major Otipemisiwak Métis Government solar initiative is the Salay Prayzaan solar project, our 4.86-megawatt AC, community-generation solar farm. Located at Métis Crossing, its output is equivalent to the power required by 1200 homes!

Many of our sites and buildings are powered by their own rooftop or own-use solar systems, which helps reduce our greenhouse gas emissions and lowers our energy bills.



Photo of Salay Prayzaan

## DID YOU KNOW?

- Solar panels are 90% recyclable by mass, and almost all their metal, glass, and silicon can be recycled ([renewablesassociation.ca/wp-content/uploads/2025/01/CanREA-factsheet-Recycling-solar-panels.pdf](http://renewablesassociation.ca/wp-content/uploads/2025/01/CanREA-factsheet-Recycling-solar-panels.pdf)).

However, their characteristics (e.g., size, layered construction) make them challenging to recycle on a small scale ([albertarecycling.ca/initiatives/research-and-development/](http://albertarecycling.ca/initiatives/research-and-development/)).

As Canada's solar industry expands, innovators are exploring new methods to source raw materials, reuse components, and responsibly dispose of solar power systems to enhance sustainability.

- According to the Canadian Renewable Energy Association, solar power systems are typically designed to have a lifespan of 25 years. Solar panels often outlast this expectancy: after 25 years, panels can produce approximately 80% of their original output ([renewablesassociation.ca/wp-content/uploads/2025/01/CanREA-factsheet-Recycling-solar-panels.pdf](http://renewablesassociation.ca/wp-content/uploads/2025/01/CanREA-factsheet-Recycling-solar-panels.pdf)).
- Researchers at NAIT evaluated how snow impacts solar panels' energy output and how their tilt affects their productivity. As a result of this work, they discovered that the energy output of panels set to a 45-degree angle decreased by only 3% due to snow coverage ([techlifetoday.nait.ca/articles/2018/solar-shines-in-dead-of-winter-even-in-edmonton](http://techlifetoday.nait.ca/articles/2018/solar-shines-in-dead-of-winter-even-in-edmonton)).
- According to the 2013 World Energy Resources: Solar report, the total annual solar radiation falling on the earth is more than 7 500 times the world's total annual primary energy consumption of 450 EJ ([worldenergy.org/assets/images/imported/2013/10/WER\\_2013\\_8\\_Solar\\_revised.pdf](http://worldenergy.org/assets/images/imported/2013/10/WER_2013_8_Solar_revised.pdf)).

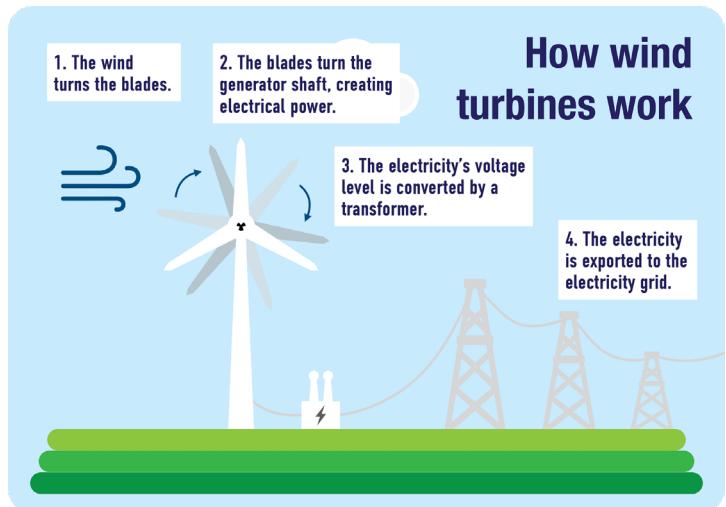
# WIND POWER

Wind power is produced when gusts of wind are used to generate electricity through technology like wind turbines.

## Generating Wind Power

Wind turbines capture the motion-based energy from gusts of wind and convert it into electricity via a multi-step process:

1. Wind blows against the turbine's blades, causing them to spin.
2. The spinning blades turn a rotor connected to a generator, which converts the resulting energy into electricity.
3. A transformer increases the voltage of the electricity so that it can be transmitted to the grid, where it is then distributed.



## Wind Power in Your Life

In 1993, Canada's first commercial wind farm was built in Alberta near Pincher Creek, marking a significant milestone in the country's sustainable energy development.



## DID YOU KNOW?

Both wind and solar power are linked to the sun!

As the sun shines on Earth's diverse landscapes throughout the day, it heats the air in different locations.

When this warm air rises, local air pressure falls, causing air particles from areas with high air pressure to rush in. We experience this phenomenon as wind.

## GEOTHERMAL POWER

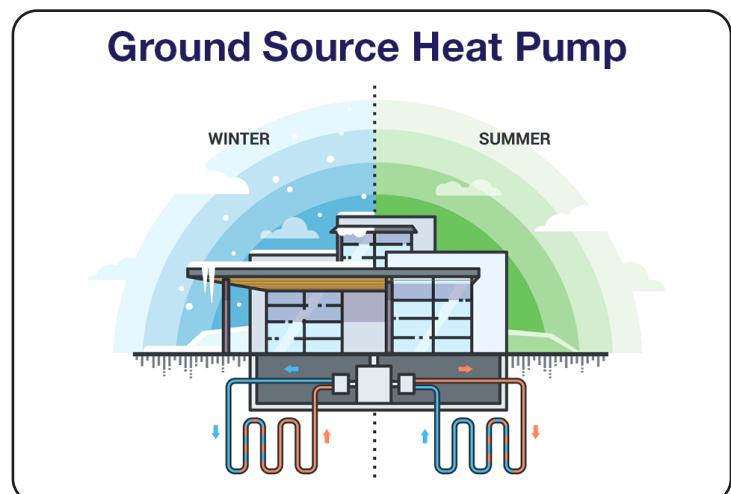
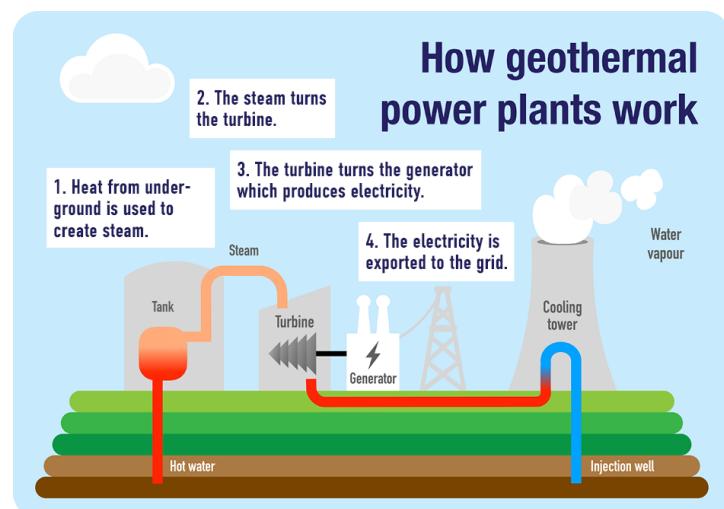
Geothermal power utilizes the heat underneath the Earth's surface and can be used to either heat and cool spaces or generate electricity.

### Generating Geothermal Power

There are two kinds of geothermal energy: deep geothermal systems and ground source heat pumps (GSHP). While both systems rely on the Earth's heat, they work in different ways and serve different purposes.

Deep geothermal systems tap into extremely high temperatures found several kilometers underground. This intense heat is used to generate electricity by spinning a turbine, often in large-scale power plants. While geothermal systems could potentially be installed and generate electricity across Canada, all levels of government must conduct rigorous research to determine whether this can be done sustainably. Any regulatory frameworks that are used to guide widespread implementation of geothermal systems must be built on this research.

Ground source heat pumps (also called geothermal heat pumps) use the stable, shallow ground temperature just a few



meters below the surface to heat and cool buildings. While they don't generate electricity, they are easier to install on a widespread basis. In the winter, the system pulls heat from the ground and brings it inside to warm the building. In the summer, it removes heat from the building and transfers it into cooler ground, helping to regulate the indoor temperature.

## Geothermal Power in Your Life

According to Blatchford Renewable Energy, the neighbourhood uses a District Energy Sharing System, which distributes thermal energy to multiple buildings for heating, cooling, and producing hot water ([blatchfordutility.ca/district-energy-sharing](http://blatchfordutility.ca/district-energy-sharing)).

### DID YOU KNOW?

Unlike solar and wind energy, geothermal energy is generated 24/7. This makes it a predictable and reliable power source.

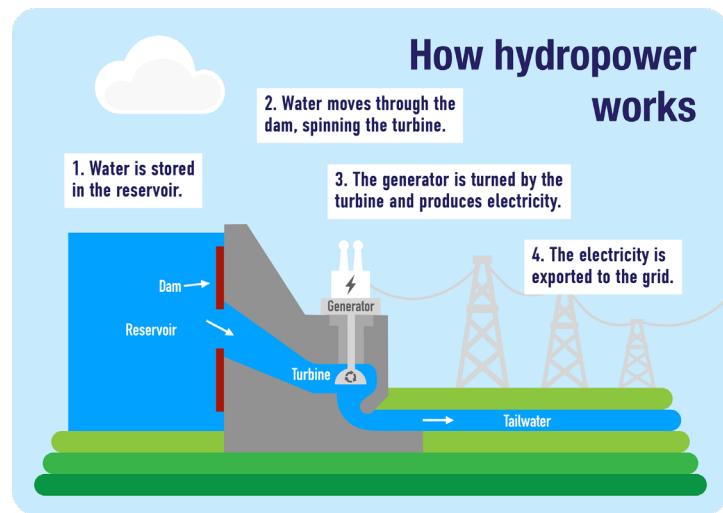
## HYDROELECTRIC POWER

Hydroelectric power is generated by power plants that are situated near large bodies of water, such as rivers or lakes. The energy from the flow of water can be used to generate electricity.

### Generating Hydroelectric Power

Hydroelectric power plants generate electric energy via a multi-step process:

1. Water is collected in large reservoirs to control the flow rate.
2. When the water is released from the reservoir, the flow of the water turns the turbines.
3. As the water flows through the turbines, the turbines turn generators, which convert the energy into electricity.
4. The electricity from the generators is transmitted to the grid.



## Hydroelectric Power in Your Life

Alberta has over 20 hydroelectric facilities ([waterpowercanada.ca/learn/hydropower-in-canada/](http://waterpowercanada.ca/learn/hydropower-in-canada/)). According to the following CBC article, the province's hydro facilities generated approximately 3–5% of Alberta's power capacity in 2023 ([cbc.ca/news/canada/edmonton/hydro-once-made-up-around-half-of-alberta-s-power-capacity-why-does-alberta-have-so-little-now-1.6744209](https://cbc.ca/news/canada/edmonton/hydro-once-made-up-around-half-of-alberta-s-power-capacity-why-does-alberta-have-so-little-now-1.6744209)).

To view a map of Canada's waterpower generating facilities, visit [waterpowercanada.ca/learn/hydropower-in-canada/](http://waterpowercanada.ca/learn/hydropower-in-canada/)

### DID YOU KNOW?

In 2022, hydroelectricity accounted for 61.7% of Canada's electricity generation, according to Natural Resources Canada ([natural-resources.canada.ca/energy-sources/renewable-energy/hydroelectric-energy](https://natural-resources.canada.ca/energy-sources/renewable-energy/hydroelectric-energy)).

In contrast, AESO's 2022 Annual Market Statistics show that hydroelectricity only accounted for 2.3% of the electricity generated in Alberta that year ([www.aeso.ca/assets/Uploads/market-and-system-reporting/2022\\_Annual\\_Market\\_Stats\\_Final.pdf](https://www.aeso.ca/assets/Uploads/market-and-system-reporting/2022_Annual_Market_Stats_Final.pdf)). This is because Alberta has a limited number of rivers that can support large hydroelectric power plants.

According to the Government of Alberta, the majority of Alberta's best hydroelectric energy sources have already been built out. However, the province notes that recent technological advances could make previously ineligible water bodies potential hydro candidates ([history.alberta.ca/energyheritage/energy/hydro-power/hydroelectricity-in-alberta-today.aspx](https://history.alberta.ca/energyheritage/energy/hydro-power/hydroelectricity-in-alberta-today.aspx)).



# RESOURCES

## Solar Energy:

- Solar Alberta: [solaralberta.ca/learning-jobs/learn-about-solar/](http://solaralberta.ca/learning-jobs/learn-about-solar/)
- Canadian Renewable Energy Association – How Solar Works: [renewablesassociation.ca/how-solar-works/](http://renewablesassociation.ca/how-solar-works/)
- Canadian Renewable Energy Association – Recycling Solar Panels: [renewablesassociation.ca/wp-content/uploads/2025/01/CanREA-factsheet-Recycling-solar-panels.pdf](http://renewablesassociation.ca/wp-content/uploads/2025/01/CanREA-factsheet-Recycling-solar-panels.pdf)
- Alberta Recycling Management Authority: [albertarecycling.ca/initiatives/research-and-development/](http://albertarecycling.ca/initiatives/research-and-development/)
- World Energy Council – World Energy Resources: Solar: [worldenergy.org/assets/images/imported/2013/10/WER\\_2013\\_8\\_Solar\\_revised.pdf](http://worldenergy.org/assets/images/imported/2013/10/WER_2013_8_Solar_revised.pdf)
- NAIT Techlife – Solar Panel Efficiency: [techlifetoday.nait.ca/articles/2018/solar-shines-in-dead-of-winter-even-in-edmonton](http://techlifetoday.nait.ca/articles/2018/solar-shines-in-dead-of-winter-even-in-edmonton)

## Wind Energy:

- Government of Canada – Wind Energy: [natural-resources.canada.ca/energy-sources/renewable-energy/wind-energy](http://natural-resources.canada.ca/energy-sources/renewable-energy/wind-energy)
- Canadian Renewable Energy Association – Wind Energy: [renewablesassociation.ca/wind-energy/](http://renewablesassociation.ca/wind-energy/)

## Geothermal Energy:

- Alberta Energy Regulator – Geothermal Energy: [ags.aer.ca/our-science/geothermal-energy](http://ags.aer.ca/our-science/geothermal-energy)
- Government of Canada – Geothermal Energy: [natural-resources.canada.ca/energy-sources/renewable-energy/geothermal-energy](http://natural-resources.canada.ca/energy-sources/renewable-energy/geothermal-energy)
- Blatchford Renewable Energy – District Energy Sharing: [blatchfordutility.ca/district-energy-sharing/](http://blatchfordutility.ca/district-energy-sharing/)

## Hydroelectric Energy:

- Government of Canada – Hydroelectric Energy: [natural-resources.canada.ca/energy-sources/renewable-energy/hydroelectric-energy](http://natural-resources.canada.ca/energy-sources/renewable-energy/hydroelectric-energy)
- Alberta – Culture and Tourism: [history.alberta.ca/energyheritage/energy/hydro-power/default.aspx](http://history.alberta.ca/energyheritage/energy/hydro-power/default.aspx)
- WaterPower Canada: [waterpowercanada.ca/](http://waterpowercanada.ca/)
- WaterPower Canada – Hydropower in Canada: [waterpowercanada.ca/learn/hydropower-in-canada/](http://waterpowercanada.ca/learn/hydropower-in-canada/)

- CBC – Alberta’s Hydroelectric Facilities: [cbc.ca/news/canada/edmonton/hydro-once-made-up-around-half-of-alberta-s-power-capacity-why-does-alberta-have-so-little-now-1.6744209](http://cbc.ca/news/canada/edmonton/hydro-once-made-up-around-half-of-alberta-s-power-capacity-why-does-alberta-have-so-little-now-1.6744209)
- AESO – 2022 Annual Market Statistics: [aeso.ca/assets/Uploads/market-and-system-reporting/2022\\_Annual\\_Market\\_Stats\\_Final.pdf](http://aeso.ca/assets/Uploads/market-and-system-reporting/2022_Annual_Market_Stats_Final.pdf)

## General Renewable Energy:

- Otipemisiwak Métis Government – Energy and Climate Change Community Engagement Sessions: [albertammetis.com/energy-and-climate-change-community-engagement-sessions/](http://albertammetis.com/energy-and-climate-change-community-engagement-sessions/)
- Canada Energy Regulator – Alberta Profile: [cer-rec.gc.ca/en/data-analysis/energy-markets/provincial-territorial-energy-profiles/provincial-territorial-energy-profiles-alberta.html](http://cer-rec.gc.ca/en/data-analysis/energy-markets/provincial-territorial-energy-profiles/provincial-territorial-energy-profiles-alberta.html)
- Government of Alberta – Phasing Out Emissions From Coal: [alberta.ca/climate-coal-electricity](http://alberta.ca/climate-coal-electricity)
- Government of Canada (Canada Energy Regulator): [cer-rec.gc.ca/en/data-analysis/energy-markets/provincial-territorial-energy-profiles/provincial-territorial-energy-profiles-alberta.html](http://cer-rec.gc.ca/en/data-analysis/energy-markets/provincial-territorial-energy-profiles/provincial-territorial-energy-profiles-alberta.html)
- Government of Canada – Clean Electricity Overview: [canada.ca/en/services/environment/weather/climatechange/climate-plan/clean-electricity/overview-alberta.html](http://canada.ca/en/services/environment/weather/climatechange/climate-plan/clean-electricity/overview-alberta.html)
- Canadian Renewable Energy Association – NEWS RELEASE: New 2023 data shows 11.2% growth for wind, solar & energy storage: [renewablesassociation.ca/news-release-new-2023-data-shows-11-2-growth-for-wind-solar-energy-storage/](http://renewablesassociation.ca/news-release-new-2023-data-shows-11-2-growth-for-wind-solar-energy-storage/)
- AESO – 2023 Year in Review: [aeso.ca/assets/2023-AESO-Year-in-Review\\_WEB.pdf](http://aeso.ca/assets/2023-AESO-Year-in-Review_WEB.pdf)
- AESO – 2024 Annual Report: [aeso.ca/assets/2024-AESO-Annual-Report.pdf](http://aeso.ca/assets/2024-AESO-Annual-Report.pdf)
- Canadian Renewable Energy Association: [renewablesassociation.ca/](http://renewablesassociation.ca/)



## CONTACT US!

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