

GREENING THE GRID

FACT SHEET

Powering Alberta's Future with Renewable Energy

Alberta's sustainable electricity resources could replace coal in 20 years

Clean, renewable and transitional energy resources in Alberta are more than capable of meeting future demand in the province, even if electricity consumption doubles over the next 20 years. Alberta can harness this energy with proven technologies already in use in Alberta and elsewhere.

David Dodge, The Pembina Institute



Alberta's electricity system, which is based primarily on coal, is the dirtiest in Canada and among the most polluting of any jurisdiction in the world.

David Dodge, The Pembina Institute



Will Alberta's future be green or brown?

Albertans face a choice: Do we want to build a future with clean, efficient, sustainable electricity sources or do we want to continue using the old, wasteful, polluting systems that are increasingly obsolete?

Changing our electricity system will be challenging, but renewable and transitional energy options offer a phenomenal business opportunity for Albertans. Markets will increasingly favour renewable energy as society forces existing companies to bear the full cost of their pollution.

Although Alberta was Canada's leading wind energy producer for many years, in 2008 both Ontario and Quebec surpassed it. In spite of 15 years of wind development, Alberta still takes advantage of less than 1% of the estimated total wind energy potential in the province.

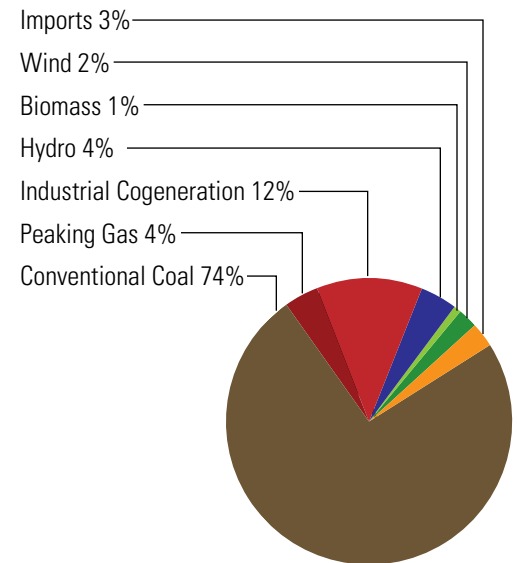
A model of efficiency

In 1999, Texas became one of the first jurisdictions to introduce mandatory energy savings goals for utilities. As required, electric utilities there have successfully met 10% of the annual growth in demand through energy efficiency instead of building new facilities.

Alberta's Current Electricity Mix Relies on Dirty, Wasteful Technology

1. One-quarter of Alberta's greenhouse gas emissions come from electricity generation.
2. Electricity generation produces 80% of Alberta's airborne mercury pollution and 30% of its acid rain-causing sulphur oxide emissions.
3. Power plants draw the second highest volume of water in Alberta after irrigation. About 4% of the water allocated for cooling is never returned to its watershed.
4. Coal-based electricity generation is forcing Alberta taxpayers to bear the costs of pollution. For example, the Alberta government recently promised \$2 billion dollars to help industry cover the costs of capturing and storing carbon pollution.
5. Coal plants are inefficient: almost two-thirds of the energy found in the coal they burn is lost out the smoke stack. Many advanced countries employ combined heat and power systems to ensure this valuable energy is not wasted.
6. If Alberta continues to rely on coal for most of its electricity, total greenhouse gas emissions will continue to increase, even if new coal plants are able to capture and store their carbon pollution. Investing in renewables, on the other hand, could allow absolute greenhouse gas reductions of 66% from 2007 levels by 2028.

Alberta's Current Electricity Generation



Solar-Fabrik, a solar energy manufacturing company in Germany, employs almost 300 people. Since 1999, the entire factory has been powered and heated using "net zero emission" technologies through a combination of solar energy and a canola oil-fired cogeneration plant.

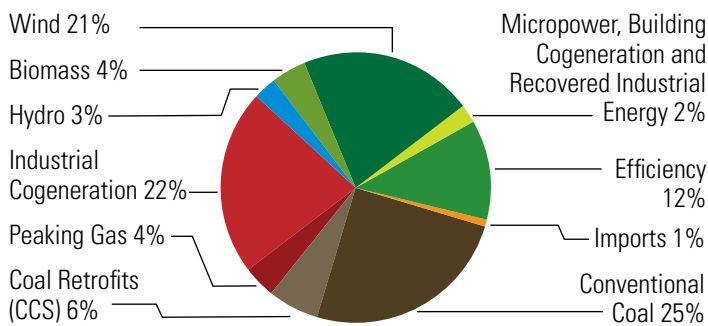


Colour Alberta Green: Two Scenarios

Greening the Grid looks at different scenarios for Alberta's future electricity generating mix that will get the province away from its "business as usual" reliance on dirty coal-fired power plants.

Under the "Pale Green" scenario, investments in a portfolio of cleaner options using technology that is proven today, mainly efficiency, wind and natural gas cogeneration, could meet the gap

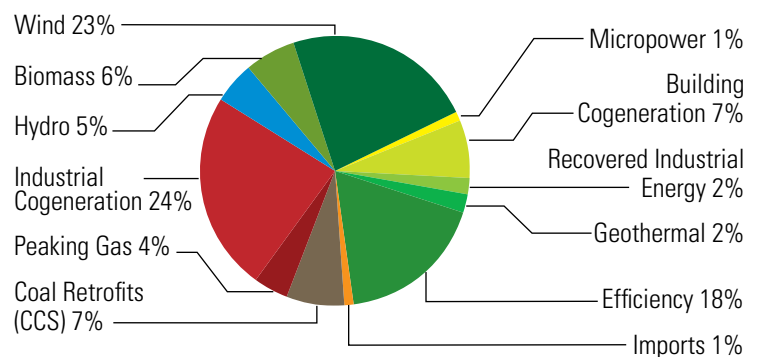
Alberta's electricity generation in 2028 under the Pale Green scenario.



in Alberta's anticipated demand over the next 20 years without having to resort to building new coal or nuclear plants.

The "Green" scenario shows that if Albertans set their sights higher, the province could generate so much energy from renewable and transitional technologies that it could begin to phase out existing coal generation.

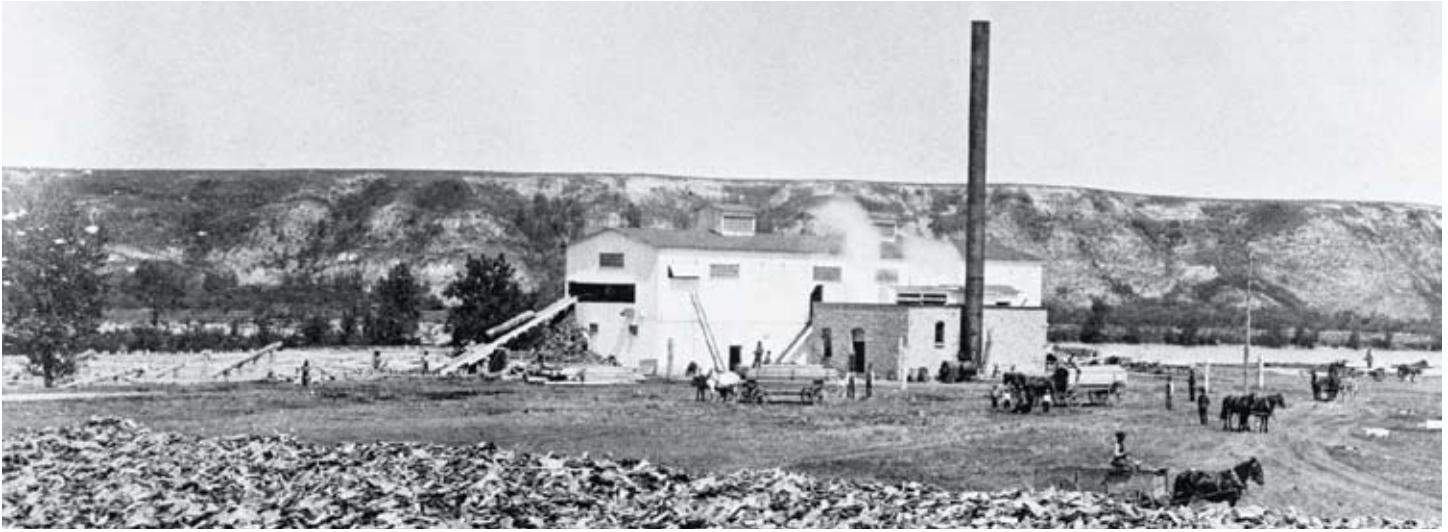
Alberta's electricity generation in 2028 under the Green scenario.



Menu of Ways to Green Alberta's Grid

We can transform Alberta's electricity supply from a system based on coal to one based entirely on a diverse menu of cleaner options.

Technology	Description	Approximate Cost to Install (\$/MWh)	Approximate Generating Potential (MW)
EFFICIENCY	Decreasing the energy used for each unit of output is the single smartest, cheapest and cleanest way to meet future electricity demand.	27	3,200
WIND	Alberta has one of Canada's best wind resources, but it has only begun to tap its potential. Alberta currently generates about 2% of its annual electricity supply from the wind, while Denmark has been able to generate close to 20% since 2004.	75	64,000
HYDRO	The Canadian Hydro Association estimates that there is more untapped hydro potential in Alberta than its total existing coal capacity.	60	11,600
BIOMASS	Energy from agriculture and forest waste could become a sustainable source of fuel for generating electricity in Alberta's rural areas.	60	15,500
GEOHERMAL	Natural heat deep under the earth's surface could provide a sustainable source of electricity in Alberta and play into an existing Alberta strength: drilling.	70	10,000
COGENERATION	Electricity generation using fossil fuels produces the byproduct of heat. Capturing that heat can more than double the useful energy obtained from each unit of fuel. This cogeneration of electricity and heat from a single fuel (e.g. natural gas) could play an important transitional role in supplying Alberta's industry with heat and power and neighborhoods with district energy.	75	10,000
RECOVERED INDUSTRIAL ENERGY	Every year the energy equivalent of millions of barrels of oil is wasted as heat that escapes up smokestacks in Alberta industrial facilities. In many cases, this heat is of sufficient temperature to generate electricity.	25	2,000
MICROPOWER	A diversity of small-scale technologies, such as solar, wind and cogeneration, could allow Alberta's farms, homes and businesses to become energy independent while reducing their environmental footprint.	250	11,500
VIRTUAL POWER PLANTS	Remote communication technology could allow the strategic control of large numbers of small machines or appliances. Temporarily slowing or deferring such resources could displace the need for up to 10% of electricity at peak times.	N/A	1,000
POWER STORAGE	Technologies that allow electricity to be stored (including pumped water, compressed air and batteries) will facilitate the integration of large amounts of wind power and other variable electricity sources to meet demand.	60-300	N/A
CARBON CAPTURE AND STORAGE	Carbon capture and storage technologies, although the costs are still unknown, are likely to play some role in cleaning up the province's existing coal plants.	85-150	10,000



Getting to Green

Countries, states and provinces that have successfully deployed renewables have all been led by strong government vision and commitment. Alberta's government can immediately take the following four near-term steps to help reduce pollution and start greening the grid:

1. Establish a Renewable Electricity Task Force

Given the enormous renewable potential in Alberta, the government should appoint a panel to examine the most effective policies to take advantage of these natural resources. Alberta has already appointed expert panels to examine the potential role of nuclear power and carbon capture and storage in the province. A renewable task force would complement and balance the work done by the current task forces.

2. Develop a Comprehensive Energy Efficiency and Conservation Strategy

The Alberta government committed to passing an *Energy Efficiency Act*, which is an opportunity for it to show bold leadership in making Alberta energy use more cost effective. In addition, Alberta could promote a culture of smart energy users through training and outreach programs, low-interest loans and regularly updated efficiency regulations.

3. Conduct a Renewable Energy Assessment for Alberta

To understand how to best plan for and strategically develop its renewable resources, Alberta needs to determine the full potential for the various renewable and transitional energies across the province. A *Renewable Energy Assessment* for Alberta would provide detailed information for public and private decision-makers about the quantity, quality and location of the province's renewable resources.

4. Earmark Funds for Renewable Energy

Alaska is using its fossil fuel revenues to create a quarter-billion-dollar Renewable Energy Fund. A comparable investment in renewables in Alberta, which has over five times the population, would still be less than the money already allocated to carbon capture and storage. In addition, significant opportunity exists for investments in research efforts to drive renewable enabling technologies, such as power integration, management and storage. These investments would not only help Alberta green its grid at home, but also enable it to export products and skills to the booming global renewable energy industry.

Full Circle: Alberta's first power plant was a renewably fuelled cogeneration plant in Calgary. Built in 1889, it burned lumber sawdust to generate electricity for street lighting. Waste heat from the steam-driven generator supplied process heat in the mill.



The Integrated Manure Utilization System in Vegreville, Alberta, generates electricity from renewable animal waste and uses waste heat for internal processes.

Want More Information

You can download the full report, **Greening Greening the Grid: Powering Alberta's Future With Renewable Energy**, and contact Tim Weis, the author of the report at re.pembina.org. Other reports are also available at the site that explain in more detail many renewable energy concepts.