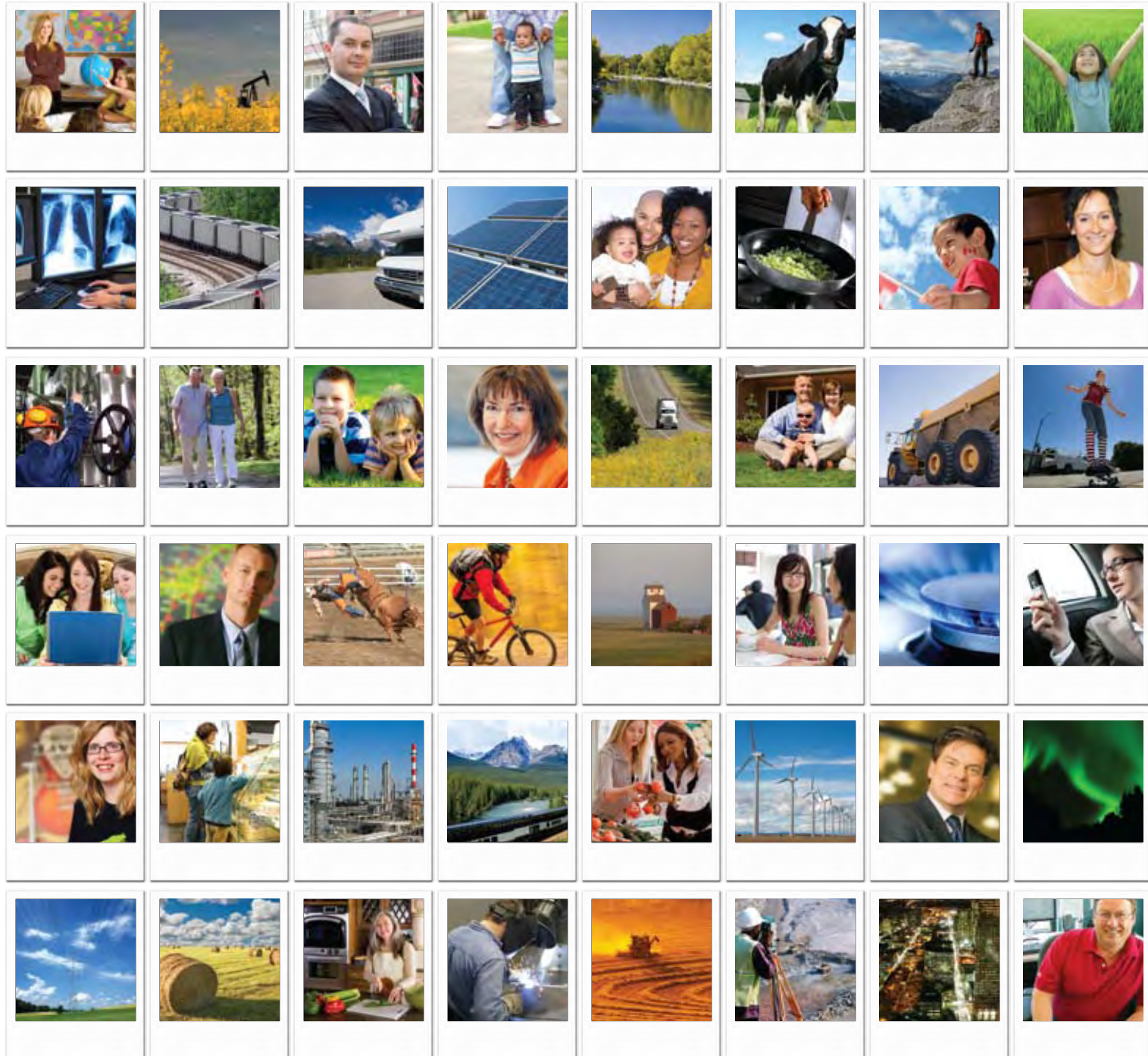
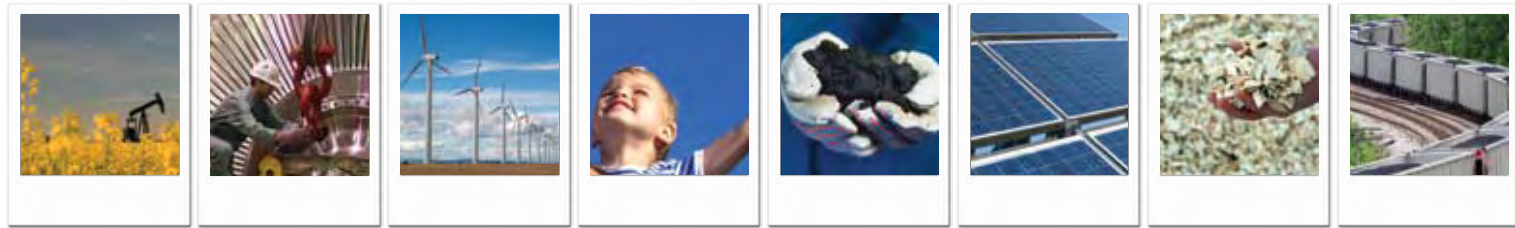


Energy: An Alberta Snapshot



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THANKS TO OUR SPONSORS



Energy Defines Alberta

We find it in the ground, in the wind and in the unique Albertans who shape our province. Driven by Alberta's vision of sustainability and our innovative, entrepreneurial spirit, we are a province that believes energy can be produced both profitably and responsibly.

In this supplement, you will learn about the continuously improving technology that allows Albertans to draw energy from our province every day. From improving oil sands technology that reuses precious water to the Alberta government's plans for an expanded role for wind power, innovation allows both industry and everyday Albertans to benefit from our collective energy reserves.

This is your guide to Alberta energy. Covering a range of fuel sources like biofuels and conventional oil and gas, as well as programs that are improving Alberta's energy efficiency, these stories survey the ways Albertans generate and use our power.

Along with our sponsors, The Calgary Herald and the Centre for Energy proudly present these stories of Alberta energy, the Albertans who are making a difference and the technologies that are helping them make it.

The economic benefits

The oil and gas industry puts billions into Alberta's economy and the effects are felt everywhere. One in six Albertans is employed by the oil and gas industry, according to 2007 statistics compiled by the Canadian Association of Petroleum Producers (CAPP) and Alberta Energy.

Beyond being Alberta's biggest employer, the industry also provides economic benefits to everyone who isn't directly employed in the oil patch. Oil and gas income feeds into municipal taxes, retail sales and thousands of Alberta jobs.

What's more, in addition to the revenue contributed to Albertans, in 2007 the industry paid \$11.2 billion to the province in royalties,

fees and bonuses, according to CAPP. And although 2007 oil and gas industry capital spending was down slightly from 2006, spending has more than doubled since 2000. Conventional oil and gas capital spending in Alberta has increased 78.3 per cent to \$23 billion from \$12.9 billion and oil sands capital spending has risen almost 300 per cent to \$17 billion from \$4.3 billion.

Fuelling this flow of money is Alberta's production of energy — from crude oil and natural gas to coalbed methane and the oil sands.

In fact, Alberta produces about 70 per cent of Canada's crude oil and 80 per cent of its natural gas. More than 80 per cent of total industry spending is directed into our province.

Jobs, investment, profits and royalties — oil and gas fuels everything Albertan and its importance is still growing.

The oil and gas industry, including the service companies that drill wells and perform other essential tasks, provides about 275,000 jobs in Alberta. But the employment numbers get even higher.

According to the Canadian Association of Petroleum Producers (CAPP), in 2007 the Alberta oil and gas industry spent \$40 billion on capital projects, of which \$23 billion (58 per cent) went into conventional exploration and production work. In addition to providing employment, this investment also feeds back into Alberta through royalty payments.

A new royalty formula announced by the provincial government will boost revenues by \$1.8 billion per year in 2009 provided conventional oil and gas production levels continue. And with Alberta budget estimates based on average oil prices of around \$78 US per barrel through 2009 (despite current oil prices of over \$125 US per barrel) revenues can be expected to exceed government projections.

Still, higher oil prices have not come without financial costs for the industry. Nationwide, while annual industry revenues rose 240 per cent over the last 10 years, reaching \$106.5 billion in 2006, payments to all levels of government across Canada increased 280 per cent to \$27 billion. Capital spending also jumped 265 per cent, partly due to rising costs.

David Pryce, CAPP's Vice-President for Western Canada, says increased provincial royalty revenues on existing production could be offset to some degree by reduced bids at future government sales of oil and gas leases as companies seek to hold the line on spending.

Natural gas drilling peaked in 2005 at 13,268 wells, up 75 per cent from five years previous. However, over the past two years, natural gas drilling has dropped 40 per cent to around 8,000 wells.

Meanwhile, activity levels are getting a shot in the arm from the price of natural gas. Prices that have languished around \$6.50 per thousand cubic feet for two years have recently reached over \$10 and the Canadian Association of Oilwell Drilling Contractors has adjusted its Western-Canada drilling projections from 14,500 wells in 2008 to 16,500. Despite the high prices for oil and relatively low prices for natural gas, natural gas has accounted for between 70 and 85 per cent of successful wells in Alberta.

ROXANNE PETTIPAS

**Engineer and Air Emissions Management Specialist,
ConocoPhillips Canada**



When Roxanne Pettipas points her high-tech infrared camera, she's an environmental detective on the hunt for emissions that can't be seen by the naked eye.

As an engineer and air emissions management specialist with ConocoPhillips, Pettipas helps meet the challenge of growing energy demand while reducing the industry's environmental impact.

"Companies like ConocoPhillips recognize the need for environmental specialists and they understand our role in helping to develop the resource responsibly," she says.

"It's an industry that is dynamic and complex, which means there are many opportunities for people like me to learn, grow and develop creative solutions."

Those creative solutions include a huge investment in the development of new technology. For example, ConocoPhillips is planning to spend about \$400 million worldwide this year on research and new technology designed to meet energy demand while minimizing the environmental consequences. This includes investment in areas like alternative fuels, energy efficiency and managing greenhouse gas emissions.

Which brings us back to that camera.

ConocoPhillips' Fugitive Emissions Management Program, which uses its innovative camera technology, has enabled the company to identify minor gas leaks so field operators can repair the sources. Since April 2006, engineers like Pettipas have played an integral role in making this program a success. This program increases energy efficiency and improves company safety and environmental performance.

Pettipas says she looks forward to contributing to a bright future for Canada's energy industry and new technology and research will play a big role in managing environmental performance.

"The oil and gas industry is innovative and invests in technology development, more so than I think many people realize," she says. "I think ConocoPhillips is one of many companies that are working hard to improve our performance and work toward a sustainable future."

ABOUT CONOCOPHILLIPS CANADA

Based in Calgary, ConocoPhillips is one of the top natural gas producers in the country. Its world-class portfolio includes assets in Western Canada, the Arctic, Atlantic Canada and oil sands interests near Fort McMurray.

ROB PETRONE

**District Superintendent,
Grande Prairie Area,
Devon Canada**



Rob Petrone's job title says District Superintendent, but his title doesn't tell the whole story.

Communications, technology, environmental stewardship: they're all part of his day-to-day work on the ground with the oil patch's diverse collection of engineers, drillers and other skilled workers. And it's that sense of cooperation that continues to drive Petrone's work in Grande Prairie.

"As a district superintendent, one of the other things I enjoy is communicating with all the different folks that do different things," he says. "Devon has many divisions like the drilling, completions, facilities and explorations groups, and I get to communicate with them on a regular basis."

But Petrone's job satisfaction doesn't mean there aren't challenges. Like other Alberta companies, Devon struggles with the province's worker shortage and the task of reducing its environmental footprint. Finding skilled employees continues to be a challenge, but new technologies are reducing Devon's carbon footprint every day.

"We optimize field compression to reduce greenhouse gas emissions, and we install new technology as it becomes available and is proven."

And while Petrone takes pride in the industry's environmental improvements, he also notes the majority of revenue generated from oil and gas activity is re-invested. It's a kind of financial recycling that's good for the immediate Albertan environment, and an essential story of the Alberta economy.

"(Revenue) goes back into the industry for further development and to find new reserves to replace the depleted ones, which is the real driver of the economy in Alberta and the oil and gas industry," he says.

ABOUT DEVON CANADA

Devon is among the largest independent oil and gas producers in Canada, focusing 65 per cent of its Canadian production on natural gas. Devon is active in the Athabasca oil sands through its Jackfish project, which began producing in late 2007.

There are currently over 32,500 producing oil wells and 95,800 gas wells in Alberta.



CHUCK SZMURLO

Vice-President of Alternative and Emerging Technology
and President of Wind Energy, Enbridge Inc.



“To go where no one has gone before” is a mantra that’s served Chuck Szmurlo well over the years. And while Enbridge’s Vice-President of Alternative and Emerging Technology may not chart new frontiers from a starship, he is embracing technological advancements that will change how Albertans, and Canadians, view energy.

“We are on the leading edge of technology and it is exciting to see new ideas come to fruition,” says Szmurlo.

“We are working to make the planet a better place by lowering the emissions of the energy we transport.”

He says the industry is facing many challenges in its journey towards renewable energy production, including the regulation process itself.

Proving its use, Enbridge has already introduced this cleaner fuel cell technology into its pipeline system. The Enbridge and FuelCell Energy Inc. system integrates a gas expansion turbine (turboexpander) and a fuel cell power plant.

The turboexpander harnesses the energy generated when the compressed gas from Enbridge’s pipelines is decompressed and expanded.

“The system is essentially a multi-megawatt power plant that is capable of providing clean electrical power to thousands of homes and businesses with virtually no harmful air emissions,” explains

Szmurlo. “This energy, which is normally lost during the decompression process, drives an electric generator. The fuel cell then converts some of the natural gas into electrical power through a non-combustion electrochemical reaction.”

Szmurlo notes this fuel cell technology can be applied in other Canadian industries and used throughout the world. But Enbridge’s environmentally friendly technology doesn’t just include fuel cells.

“One challenge is getting the government to treat fuel cells in the same regulatory manner as they do wind power,” says Szmurlo. “By using fuel cells, we are able to generate electricity through electrochemical conversion, which is much cleaner than generating it through combustion. Fuel cells generate environmentally-friendly power and should be recognized as such.”

Szmurlo is also leading the Alberta Saline Aquifer Project (ASAP), an industry initiative to find subterranean formations capable of storing captured carbon dioxide. It’s just another way Enbridge is charting a new environmental course, going where no one has gone before.

ABOUT ENBRIDGE

Calgary-based Enbridge operates the world’s longest crude oil and liquids pipeline system, which runs through Canada and the United States. It also serves 1.8 million customers through Enbridge Gas Distribution in Ontario, Quebec, New Brunswick and New York.



CONVENTIONAL OIL AND GAS IN ALBERTA

	CRUDE OIL	NATURAL GAS
Reserves (2006)	1,664 million barrels	40.2 trillion cubic feet
Production	525,000 barrels per day	13.2 billion cubic feet per day
Consumption	286,000 barrels per day	2.2 billion cubic feet per day
Capital Spending	\$23 billion (conventional only)	
Revenue	\$55 billion (conventional only)	
Employment	275,000 (total employment including oil sands)	

Catching invisible fugitive emission sources on camera

Catching fugitives sounds more like work for crime stoppers than an oil and gas company. But one company is catching “fugitive” emissions using an innovative infrared technology that is setting new industry standards.

ConocoPhillips Canada (CPC), one of Canada’s largest natural gas producers, recently won the 2007 Stewards of Excellence award from The Canadian Association of Petroleum Producers (CAPP) for developing a pilot study program to identify fugitive emission sources.

“Fugitive emissions” are gases, such as methane and propane, lost from production facilities and pipelines. These emissions are invisible to the naked eye and can be difficult to detect. The program founded by CPC uses a newly developed infrared gas camera technology to find emissions and a measurement tool called the “Hi-Flow Sampler” to measure the flow rate of emissions. This method is safe, fast and very effective when scanning large and hard-to-reach operating areas.

CPC identified 144 fugitive emission sources during the pilot study. The technology allowed operations employees to play back video taken of the emission sources and work to repair them. Depending on the situation, repair could be as easy as tightening a bolt or replacing a seal or could require a facility shutdown to change out or install additional equipment. As a result of the successful pilot program, a full Canada-wide program has since been developed and implemented.

The positive impact of this program is clear – identifying and repairing fugitive emission sources creates a safer working environment and reduces air emissions, including greenhouse gases.

“As an industry, we are committed to meeting Canadians’ expectations for the responsible development of our country’s resources,” says Brian Maynard, CAPP vice-president of stewardship and public affairs. “The stewardship initiative as a great report card for Canadians to see how we’re performing.”

Demands for clean and affordable power are increasing worldwide and the nuclear industry is preparing to meet them.

"This is a very mature industry in Canada when you consider that we have been involved in it for more than 60 years," says Murray Elston, President and CEO of the Canadian Nuclear Association (CNA). "Today, we're poised to do a whole lot of new work, and we're actively refurbishing existing plants."

Nuclear energy is a \$6.6 billion a year industry generating \$1.5 billion in federal and provincial revenues through taxes and \$1.3 billion in exports in 2008. What's more, according to a recent Ipsos Reid survey, more than 47 per cent of Canadians feel nuclear power should play a greater role in their province's future.

The industry in Canada already employs 71,000 workers directly and indirectly in more than 150 firms, the CNA says, and last April the government of Alberta appointed an expert panel to prepare a comprehensive report on nuclear energy examining nuclear-generated electricity's environmental and safety issues.

In all the years nuclear energy has been used to produce electricity in Canada, not one single fatality has occurred due to a radiation leak, says Elston.

"Nuclear energy is a challenging topic because it generates strong feelings and opinions - not only in Alberta, but around the world," says Alberta Energy Minister Mel Knight. "That is why developing an objective and broad-based research paper is an important first step in having informed and meaningful discussions with Albertans."

The nuclear industry must also find ways to overcome a number of barriers to growth.

"One of our biggest challenges is going to be attracting people to this industry," says Elston. "Just like everyone else, we need scientists and engineers."

"Our second challenge is finding access to materials - cement, construction steel and even copper and other materials that we have to compete for. And thirdly, we need up-front capital."

Statistics for 2007 from the Nuclear Energy Institute, based in the United States where 20 per cent of electricity is nuclear-generated, confirm that nuclear power is significantly less costly to produce than coal- or natural-gas-fired alternatives.

This means over the life cycle of a nuclear plant, the overall potential return on investment is attractive to financial backers. And in an era of cleaner fuel and increasing prices, that's an investment the nuclear industry is banking on.

ARMAND LAFERRERE

President,
AREVA Canada Inc.



For Armand Laferrere, there has never been a more exciting time to be in the nuclear industry.

"We're getting organized to face a strongly growing global demand for energy," says the president of AREVA Canada Inc. "There are currently more than 300 projects worldwide for new nuclear plants. We must be ready for these future orders."

Recent innovations, like the third-generation AREVA EPR reactors, have made nuclear power more attractive around the world, leading to developments in Finland, France and China. These designs operate at least 10 per cent more efficiently than past reactors.

"The 98 AREVA plants in operation have been operating for decades without a single major accident to report."

While the booming worldwide appetite for energy has the nuclear power industry preparing for increased activity, the industry still faces the same skilled labour shortages as most, and the need for materials and capital investment continues to grow.

"We need to be working with universities and others to increase the number of qualified personnel, as well as working with suppliers worldwide to consolidate our supply chain," says Laferrere.

But challenges aside, Laferrere, who joined the nuclear industry in 2004 after nine years in senior positions with the French government, says the tasks at hand and the increasing acceptance of nuclear energy add to the rewards of his work, reminding him why he became involved.

"I was motivated by the environmental benefits of nuclear energy," he says. "(Nuclear power) produces no CO2 and will play a significant part in addressing mankind's current energy crisis."

ABOUT AREVA

AREVA explores for uranium across Canada and operates uranium mining and milling facilities in Saskatchewan. At its operations in eastern Canada, AREVA manufactures power transmission and distribution products, radiation measuring equipment and also offers nuclear power plants engineering and staffing services.

Using turbine blades like the ones below, modern nuclear reactors have installed capacities of up to 1,000 MW.



Courtesy of Bruce Power

In 2007, with the addition of 386 MW of new emission-free wind projects, Canada's total wind power capacity grew to 1,846 MW, the 11th highest in the world.

And with an anticipated \$1.8 billion to be invested in the installation of another 800 megawatts in 2008, Canada is poised to set a new record for annual wind energy installation.

In Alberta, the wind power industry began in 1997 when TransAlta Energy Corp. tested a 660-kilowatt wind turbine near Pincher Creek. Alberta's installed capacity has since grown to 521 megawatts, the greatest installed capacity of all the provinces.

Nationwide, wind power currently produces enough electricity to supply 560,000 homes, a number provincial governments hope to expand by seeking the development of a minimum of 12,000 megawatts of installed wind energy capacity by 2016.

Those thousands of extra megawatts would quickly add up, eventually meeting five per cent of Canada's yearly electricity needs. At a time when governments and citizens are increasingly looking for green solutions, those numbers are no small incentive.

"Wind energy must be a key component of any Canadian strategy to address climate change and Canada has only scratched the surface of its massive wind energy potential," says Robert Hornung, president of the Canadian Wind Energy Association (CanWEA). "Although wind energy is growing rapidly in Canada, other countries continue to view wind energy as a strategic resource and are moving quickly to support its deployment.

"If Canada is to become a global clean-energy leader and capture the multiple economic and environmental benefits of wind energy, federal and provincial governments must start to think big about wind energy, and make it a core element of their future energy development strategies."

In Alberta, TransAlta has announced plans to design, build and operate Blue Trail, a 66-megawatt wind power project in southern Alberta, at a cost of \$115 million. The Fort Macleod-area wind farm will provide an annual average of 195,000 megawatt-hours — enough electricity to meet the needs of about 20,000 homes. The project will be commissioned by December 2009.

This is one of 5,500 MW of wind energy projects currently contracted or under construction in Canada.

With millions of watts about to be plugged into the Canadian grid, one thing's certain: change is in the wind.



WIND POWER	
WIND FARMS IN ALBERTA	18
WIND TURBINES IN ALBERTA	414
INSTALLED CAPACITY	521 megawatts
CANADA'S TOTAL INSTALLED WIND GENERATING CAPACITY	1,846 megawatts
PERCENTAGE OF THE TIME WIND IS AVAILABLE	70 - 80 per cent
AVAILABILITY FACTOR OF WIND ENERGY	98 per cent

Five years ago, wind turbines in Canada generated 600 kW. Today, the average turbine generates 1.5 MW.

THERESA HOWLAND

Vice-President, Western Region,
Bullfrog Power Inc.



For Theresa Howland, improving the future of the planet is the best part of working in the alternative energy industry.

"It's highly rewarding to be in the renewable-energy industry and working with individuals and businesses to help them reduce their own emissions footprint," says Bullfrog Power Inc.'s Western Region Vice-President.

Bullfrog provides electricity to both Alberta and Ontario using locally generated electricity from sources like wind and low-impact hydroelectric power — options made possible by continually improving technology.

"The technology — that is, the turbines used to capture the wind — has continued to evolve to allow for greater applications and an increased amount of wind energy feeding into our electrical grids."

In turn, improved efficiency translates to broader acceptance of alternative power by consumers and organizations looking for cleaner energy. That acceptance is essential for spreading the word on wind power and other green energy sources.

"The most notable environmental advance in wind energy is the recognition that it is a sustainable and clean energy resource," says Howland, "one that can reduce our reliance on fossil fuels and help address climate change."

But even with increased appreciation, educating the public is one of the biggest challenges in promoting green energy sources like wind. Before companies like Bullfrog can market their eco-friendly wares, as many consumers as possible must understand how these new technologies can change Alberta's future. Thankfully, it's a task Howland is glad to perform.

"Raising awareness of the availability of energy options will continue to be a challenge in the industry in the years ahead," she says. "I happily work to spread the word every day."

ABOUT BULLFROG POWER INC.

Bullfrog Power is a leading provider of green electricity, with service available to Alberta and Ontario residents and businesses. The company was founded in 2005.

Do you know how electricity prices are set, how much energy is consumed in Alberta each year or what the term BTU stands for? If you don't, you should turn to The Canadian Centre for Energy Information (www.centreforenergy.com), your best source for information on all things energy.

The Centre for Energy was created six years ago to provide a single source of information on Canada's

diverse energy system. Since then, the amount of information available through the Centre for Energy has grown exponentially, providing energy information to an ever-growing number of governments, educational institutions and industries across North America.

"Our first priority was to make sure all of Canada's energy system — oil and gas, nuclear, wind, solar, bio-fuels and electricity — were represented online at

www.centreforenergy.com," says Colleen Killingsworth, President of the Centre for Energy. "Once that was done, we made sure the information we had on each of these industries was complete and current, including sources, uses, production and consumption statistics and related information on the energy system."

While the vast library of information on conventional energy production continues to attract students and

THE CANADIAN CENTRE FOR ENERGY INFORMATION

OUR GOAL IS RELEVANCE AND THAT MEANS HELPING INFORM THE GROWING PUBLIC DEBATE AND DISCUSSION ABOUT ENERGY IN CANADA BY PROVIDING THE INFORMATION REQUIRED TO MAKE GOOD DECISIONS ABOUT THE ISSUES.



EXPLAIN AND EXPLORE
WITH THE CENTRE FOR ENERGY'S
COMPREHENSIVE DATABASE OF FACTS AND STATS.

DISCOVER NEW OPPORTUNITIES
USING AWARD-WINNING LEARNING
RESOURCES AND JOB BOARDS.

MAKE INFORMED CHOICES
ABOUT THE ENERGY YOU USE
AND HOW YOU USE IT.

policy-makers alike, emerging areas of interest include energy efficiency and energy alternatives.

"We are seeing increasing interest in the environmental impact of energy production and in consumer-oriented information about reducing energy consumption and finding new sources of energy. Our users are looking for information to help them reduce their own environmental footprint," says Killingsworth.

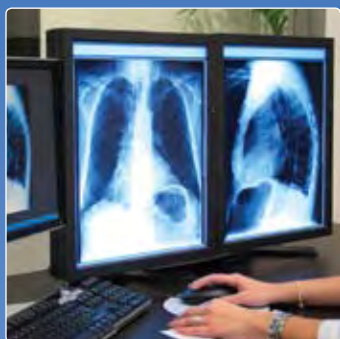
Traffic to the Centre for Energy web site reflects the current focus on how we can strike a balance between the prosperity of our economy and the stewardship of our environment.

The Centre provides information to individual Canadians to help them reduce energy consumption by harnessing new environmental technologies or changing energy consumption habits.

"With energy prices reaching record levels, and environmental issues an increasing concern, Canadians are looking for reliable sources of information to help them better understand not only why and how things are happening, but what we can each do individually to support positive change." To learn about the changes already being made and discuss how you can be a part of them visit *FLOW* magazine at www.centreflow.ca.

www.centreforenergy.com

www.centreflow.ca



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ONLINE WITH *FLOW* BY POSTING COMMENTS
AND PARTICIPATING IN POLLS.

Since 2003, investment in the oil sands has climbed from \$5 billion to \$17 billion in 2007.

With four new oil sands mining projects under construction or ready to begin, and major expansions at all three existing oil sands mines, Alberta's oil sand development is still heating up.

Four upgraders — the pre-refineries that turn bitumen into high-grade synthetic crude oil — are being expanded, 10 additional upgraders are under construction or in advanced stages of planning and more than a dozen new or expanding in-situ projects are being added to the province's production capacity.

With some 173 billion barrels of oil sands resource economically accessible at current prices, virtually every oil sands operator has lined up multiple expansion proposals. That expansion has swelled the entire industry.

Since 2007 oil sands output surpassed Alberta conventional oil production. And while conventional crude production is expected to remain flat at about one million barrels per day (bpd), the Canadian Association of Petroleum Producers (CAPP) projects the oil sands will fuel Canada's total output: from 2.7 million bpd in 2007 to 3.9 million bpd by 2015.

But all that expansion comes with some growing pains.

"Not every project will proceed on time," says CAPP Western Canada Vice-President David Pryce. "Some could be slowed or even stopped by rising costs or shortages of skilled construction labour."

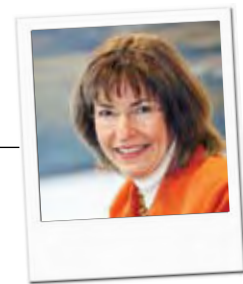
Pryce notes, water use and greenhouse gas emissions are constant issues for the oil patch in general and for the oil sands in particular. In response, many oil sands projects include advanced water recycling and cogeneration power plants that increase energy efficiencies and reduce Alberta's demand for higher-emission coal power.

Research is also being conducted on capturing carbon dioxide emissions produced from oil sands processing, either piping the captured emissions into deep underground caverns for permanent storage (sequestration) or injecting them into depleting conventional oil fields to stimulate production.

Together, the boom in production and its environmental challenges continue to add fuel to a multi-billion dollar industry, a driving Alberta force whose energy continues to move the province like a stream of superheated oil sands.

JOY ROMERO

Metallurgical Engineer, Vice-President, Bitumen Production for the Horizon Oil Sands Project with Canadian Natural Resources Limited and Chair of the Athabasca University Governing Council



Joy Romero has spent nearly her entire career in the energy business, but it isn't where she's been that excites her: it's where her industry is going.

"What I'm really excited about is the opportunity to develop and apply new science," she says.

"Every day we learn something. It's a real privilege to be a part of an industry that takes fundamental discoveries through to operations."

Romero heads Canadian Natural's Tech Net, a group of scientists who share scientific breakthroughs and technological developments. She is also active in the development in Canadian Natural's tailings technology, which has been proven successful in research trials for the past four to five years.

"People may think that all oil sands facilities are the same but each incorporates significant technical advances," says Romero, who is also Chair of the Athabasca University Governing Council.

New technologies include carbon sequestration that traps CO₂ inside the industry's "tailings," and a process of reusing warm water that will eventually allow bitumen to be produced totally with waste heat.

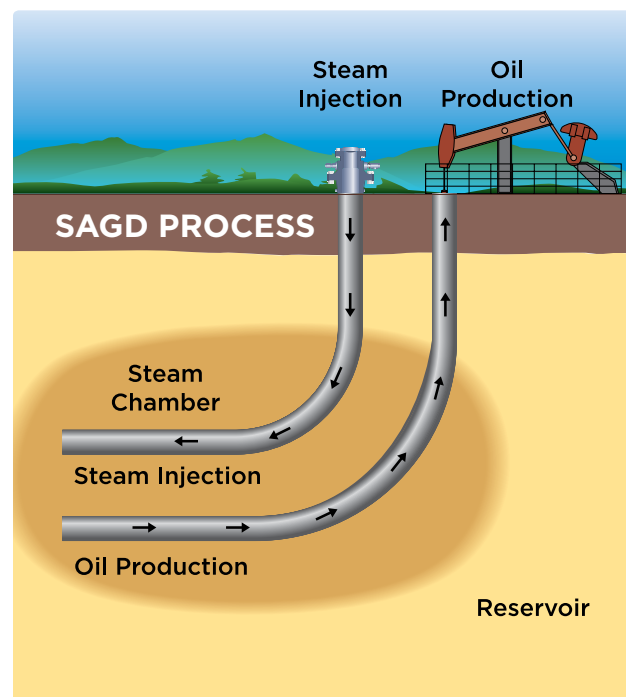
"(Discovery) really does take time and that has to be part of our message," she says. "You can't shortcut discovery, proof of concept, design and construction. But we need to remind ourselves to inform people of the advances being achieved. The projects that are built after us will be better yet and we will continuously improve."

ABOUT CANADIAN NATURAL RESOURCES LIMITED

Canadian Natural is an oil and natural gas company employing 3,700 workers. Canadian Natural operates The Horizon Oil Sands Project, located 70 kilometres north of Fort McMurray. The Horizon lease covers 115,000 acres with an estimated six to eight billion recoverable barrels.

In-situ is the process of separating the bitumen from the sand while the bitumen is still in the ground. In-situ oil production is similar to conventional oil production where oil is recovered through wells.

Every CAT 797 can carry a load of between 360 and 400 metric tonnes of oil sands.



Courtesy of Suncor Energy

DEANNA MERCER

Senior Interpreter at the Oil Sands Discovery Centre, Fort McMurray



Deanna Mercer is one of many professionals who are changing the way the world views bitumen reserves and she is doing it one visitor at a time.

As the Senior Interpreter at Fort McMurray's Oil Sands Discovery Centre, Mercer educates tourists on how oil is extracted from the sticky black sand.

“ We show them how to separate the bitumen (from the sand), and the history and technology behind the separation techniques.”

Visitors from as far away as Australia, Germany, the Philippines and South America have taken part in the interactive program, where they get an opportunity to see, smell and touch oil sand and its components: bitumen, sand and water.

“I chose this profession because I love working with the public, educating them on correct facts, figures, history and information,” says Mercer. “I enjoy greeting people from all over the world and sharing our experience.”

To highlight the changing face of the industry, the Discovery Centre also has an outdoor industrial garden exhibit where visitors can see firsthand the equipment used in the past, then take a stroll through the Centre to view the latest equipment.

The biggest challenge, says Mercer, is explaining the oil sands' complex technology and its environmental effects to visitors.

“We meet people who don't know anything about the technologies being used,” she says, adding that like the Centre's visitors, the companies involved in oil sand extraction are continuing to learn. “Minimizing the impact to the environment begins by understanding the complexity of ecosystems.”

The Centre's programs also include movie presentations, traveling exhibits, science camps, involvement in the Brownie and Guide badge program and guided historic Abasand walks to the site of one of the earliest oil sands plants in the area — Abasand Oils Ltd.

Tours of the oil sands sites can also be arranged through Fort McMurray Tourism, giving visitors a bus-seat view of the mining operation in action.

If you're lucky, Mercer might even let you play with some sand.

ABOUT THE ALBERTA GOVERNMENT'S OIL SANDS DISCOVERY CENTRE

The Alberta Government's Oil Sands Discovery Centre presents the history, science and technology of Alberta's oil sands — the world's largest single deposit of oil — through exhibits, programs and special events, tours, films and demonstrations.



OIL SANDS IN ALBERTA

	MINING	IN SITU
Reserves (under development)	18.3 billion barrels	3.7 billion barrels
Reserves (established)	31.2 billion barrels	141.5 billion barrels
Production	695,450 barrels per day	503,876 barrels per day
Projects (operating)	3	120
Projects (under construction)	2	not available
Capital Spending (2007)	\$17 billion	
Revenue	\$27 billion	

Share your toys, save the air

Calgary and Edmonton are about to clear the air, though not over their long-standing rivalry. Instead, car-sharing initiatives will be reducing those cities' greenhouse gas emissions.

For nearly eight years, the Calgary Alternative Transportation Co-operative (CATCO) has been driving a campaign to reduce vehicle emissions, cut back on the number of cars on the road and help save Calgarians more money at the pump by paying less in gas.

“Every year (vehicles) get more expensive to purchase, insure and operate. For many errands in town you can walk, bike or take transit,” says Darryl Kaminski, CATCO's acting chair. “For those occasions when you need to go further or haul more, you can borrow a vehicle that suits your needs and only pay for the hours and kilometres you use.”

CATCO members pay a one-time \$25 fee to cover the cost of a driving record, a fully refundable \$500 damage deposit equivalent to a collision deductible and \$48 in yearly maintenance.

Since launching in Calgary, the co-operative has grown its fleet from one to eight vehicles and now includes 200 members. The vehicles' locations are scattered around the city and most are located near LRT stations, major bus routes or pathways.

Similar to CATCO, the Carsharing Co-op of Edmonton (CCE) has one shared vehicle located in the Garneau district on the University of Alberta campus. The CCE hopes to add to its fleet as membership grows and additional sponsorship seed money is received. Its program costs include all the costs of the vehicle: purchase price, gas, maintenance, repairs, insurance, cleaning and administration.

Canada's electricity transmission grid is one of the world's largest, delivering hydro, thermal, nuclear and wind power across the country.

In Alberta, where electricity generation and transmission is deregulated, coal-fired thermal generation accounts for about 48 per cent of electricity, natural-gas-fired for another 38 per cent, hydro for 7.4 per cent and wind and fuel oil for two per cent and 0.1 per cent respectively. Transmission is overseen by the Alberta Electric System Operator, an independent organization responsible for planning and operating the Alberta Interconnected Electric System.

Because electricity service in Alberta is deregulated, a variety of public companies and municipalities are involved in generation and distribution.

Alberta electricity providers include AltaLink, ATCO and ENMAX while, on the distribution side, companies include Fortis Alberta, ENMAX, EPCOR, and ATCO Electric.

But despite the size of Alberta's grid and the multiple companies responsible for its operation, its lines across the continent are becoming outdated.

The North American grid is made up largely of equipment installed in the 1950s, '60s and '70s, and as Pierre Guimond, Canadian Electricity Association President and CEO, notes, much of the reinvestment in existing infrastructure will involve technology upgrades in circuit breakers, relays and structural reinforcement.

"Canadians have not seen significant infrastructure additions in decades and we need to ensure the delivery of reliable, affordable and environmentally acceptable power," he says.

Approximately \$190 billion of electricity infrastructure investment is needed by 2030 – \$95 billion in generation, \$27 billion in transmission, investment and \$63 billion in distribution. But while expensive, these costs might contain hidden benefits. Increased financial pressure on the industry, notes Guimond, could force the introduction and use of more efficient technologies.

New technology will include "smart meters," providing real-time use information, with major installation projects underway in Ontario, B.C. and Alberta. And phasor technology, designed to document electricity flows almost instantly, will allow system operators to ensure the continued reliability of Canada's massive electrical grid – across the country and into its future.

GARY HOLDEN

**President and CEO,
Enmax Corp.**



Gary Holden wants you to save money.

The CEO of Calgary-based ENMAX Corp. hopes consumers will eventually use their electricity during off-peak times or even generate their own power – just two ways to give consumers more control.

"It's a three-dimensional crisis of environmental change, rapidly rising costs and decreased social acceptability for the old ways of doing things," he says, noting solutions will come through innovative business models and new technologies.

"Many utilities are looking at so-called 'smart metering,' which will enable customers to be charged different prices at different times of day," notes Holden. "They're seeing it as a way of encouraging customers to shift some of their demand to off-peak times. But ENMAX is unique in seeing this as the enabling technology that makes it economically viable for residential customers to start generating their own electricity in ways that will reduce their environmental impact and save them money."

Consumers might, for example, install rooftop solar panels or other power-producing systems – systems ENMAX is already evaluating.

"We're currently testing competing models of both solar panels and domestic-scale wind turbines," says Holden. "And we'll also be introducing a natural gas-

fired dishwasher-sized co-generation unit that will heat your house and use the waste heat to make electricity for you.

"You'll also be able to either export your surplus electricity to the grid to save money, or send it to a battery, which you can use to fuel your plug-in hybrid car at a fuel-equivalent cost of less than 25 cents a litre."

But energy costs aren't the only hurdles ENMAX is prepared to leap. Where some see the electricity industry assailed by new challenges, Holden sees opportunity: "Not only is electricity essential to modern life, it's a complex industry, full of increasing challenges and many innovative opportunities to make things better – environmentally, economically and socially."

"Now, more than ever before in our industry's history, it is important to embrace new thinking and new technologies and to have a vision as to where that might lead all of us."

ABOUT ENMAX CORP.

ENMAX CORP. is an energy generation, distribution, supply, sales and service company with operations in Alberta and British Columbia. It is wholly owned by the City of Calgary.

Photovoltaic solar panel generating electricity from the sun.



SCOTT THON

President and CEO,
AltaLink.



“Electricity plays such an integral role in society,” says AltaLink president and CEO Scott Thon. “It’s that combination of public service and competition that helped me fall in love with this industry.”

After more than 20 years in electricity, Thon knows what keeps him energized. But while the industry’s combination of public service and competition keeps him motivated, he also sees significant challenges ahead, not the least bringing Alberta’s electricity transmission infrastructure up to date.

“The transmission grid hasn’t been expanded for more than 20 years,” says Thon, noting the impact of Alberta’s sudden population growth. “We will always need a robust transmission system, and today more than ever we need the critical upgrades to the system to ensure reliable service and a fair generation market that benefits all Albertans. But transmission alone can’t meet our needs. We need to find ways to enable future home generation using smartgrid devices and conserve the electricity we use, both at home and in the industry that powers Alberta’s economy.”

“We’ve seen phenomenal growth in the province. In the electricity world, we’re growing the equivalent of adding two cities the size of Red Deer every year.”

To meet this growth, AltaLink is designing new infrastructure and maximizing the value of existing transmission lines. While an expansion is inevitable, Thon wants to ensure it’s done with as little

environmental impact as possible. “How can we reduce the footprint,” he asks.

“We need to drive new strategies in a culture of ‘No Net New’ instead of simply building more lines and towers,” says Thon. “By finding new ways to get more out of the existing grid, re-using already built lines and focusing on new technologies we can minimize the impact on the land and landowners.”

Fortunately, advances in transmission technology are making environmentally responsible expansion possible. Underground direct current technology may soon provide the transfer capacity needed without building overhead lines.

“Another shift is to take more conventional technologies and use them in non-traditional ways,” says Thon. “For example, high-capacity, high-voltage direct current supports smaller overhead towers, sends more power than our existing systems and allows for easy future capacity increases as our province needs them.”

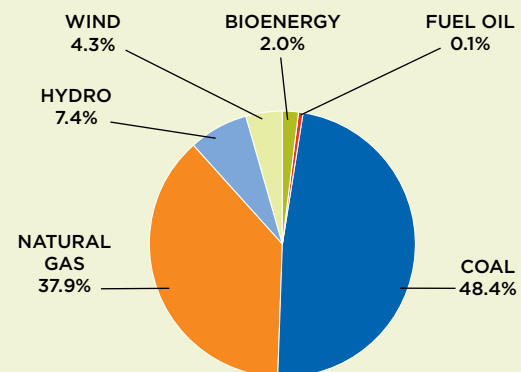
From new technologies to fresh uses of old ones, AltaLink continues to play an integral Albertan role — the same one that continues to draw Thon to the industry.

ABOUT ALTALINK

AltaLink is Canada’s first independent electricity transmission company. AltaLink is Alberta’s largest electric transmission owner and operator, providing transmission service to more than 85 per cent of Albertans.



ELECTRICITY ENERGY SOURCES IN ALBERTA



Using solar power to stay off the grid

Dave Kelly’s family converted to solar power seven years ago and all that’s changed is hundreds of saved dollars per year on their electricity bill.

“We just figured this is the way things were going,” says Kelly, President of Calgary-based Sedmek Inc., a renewable energy services company. “On the electrical side, we still get energy from ENMAX. If the modules make more energy than we need, we just feed them back into the system.”

The family of four started out with a 600-watt solar electric grid-tie system — a small system that produces electricity while still connected to the local electric or natural gas utility. Their home is now partially powered by a two-kilowatt system that produces half of their electricity, as well as a solar thermal water heating system.

A solar energy system is optimal for homes with east- to southwest-facing roofs, says Kelly.

A typical unit is a four-foot by eight-foot collector that is usually mounted on the roof and looks like a skylight. In a typical household, a two-panel hot water system would cost \$6,700 but would end up paying for itself in about 10 to 15 years, says Kelly. A two-kilowatt system, costing from \$10 to \$12 per watt, would save up to \$300 per year.

Sedmek’s systems are the only Canadian Standards Association certified systems in Canada. Currently, the City of Calgary requires those who begin using solar energy to purchase a development permit for a small power generation unit, although they are working on removing this requirement.

For current homeowners wanting to get “off the grid” and onto a renewable resource system, Sedmek can perform a site inspection and feasibility analysis to determine which, if any, of the currently available renewable energy technologies can be integrated into their home or cottage.

DON LOWRY

President and CEO,
EPCOR Utilities Inc.



The demand for electricity in Alberta is increasing and Albertans are also insisting on improved environmental attention and a secure future for Alberta's energy supply.

"There is a need for new power generation to meet the needs of our growing population and economy," says the president and CEO of EPCOR Utilities Inc.

"EPCOR is working to establish technologies that will reduce the environmental impact of coal, including the commercialization of coal gasification technology, which has the potential to deliver electricity with near-zero emissions, provide long-term energy security and improve air quality."

They're innovations that could change the face of Alberta power at a time when demand is rising.

Provincial demand, as projected by the not-for-profit Alberta Electric System Operator group will increase 42 per cent in the next decade. By 2017, Alberta will require 5,000 megawatts of electricity.

But Albertans are demanding more than electricity. In the province and across the country, customers are looking to their power companies for environmental leadership.

One of EPCOR's most important collaborations is with the Canadian Clean Power Coalition.

"Work is underway at our Genesee site, west of Edmonton, on an engineering and design study for an Integrated Gasification Combined Cycle plant that could turn coal into synthesis gas and hydrogen, and enable the capture and storage of carbon dioxide," explains Lowry.

Other environmental advances include cleaner burning coal plants.

"The Genesee 3 power plant, co-owned with TransAlta, (located 70 kilometres southwest of Edmonton) is the cleanest coal-fired generator in the country," says Lowry. "G3 is also equipped with \$90 million in clean-air technologies."

Keephills 3, also co-owned with TransAlta, is located 65 kilometres west of Edmonton in the Wabamun Lake area. It will use the same supercritical boiler technology as G3 and its CO2 emissions will be 24 per cent lower than those of the older units it replaces.

Meeting Albertans' demands for more secure, greener power may be a difficult task, but Lowry and EPCOR continue to look at a diverse range of alternative generation methods to meet all of Alberta's energy needs.

"Thirty-five per cent of our generating capacity comes from renewable and recycled sources such as wind, small hydro, biomass and waste-heat recovery."

As well, our Carbon Reduction Offsets Program has more than half a million acres under contract, from which more than 60,000 tonnes of emission reductions have so far been third-party verified — the equivalent to taking more than 15,000 cars off the road for one year."

ABOUT EPCOR UTILITIES INC.

Based in Edmonton, EPCOR is one of Canada's top providers of energy and energy-related services and products, employing more than 2,800 people and operating power generation facilities with a gross capacity of more than 3,400 megawatts.

EnCana and ConocoPhillips keep eyes on Alberta's environment

Thanks to generous corporate citizens more eyes are about to be keeping watch on Alberta's environment.

Industry partners, EnCana and ConocoPhillips Canada recently gave Keyano College in Fort McMurray \$1 million to help fund its environmental monitoring program. The 29-week program provides First Nations and Métis students as well as other qualified trainees with occupational skills training, such as applied math and computer skills, to become environmental monitors.

Students successfully completing the program receive a program certificate and, upon successful completion of safety training and after demonstrating their skills, a health and safety certificate.

"This represents a great partnership and is how we like to do business at Keyano College - focusing on the community," says Jim Foote, President of Keyano College.

The funding, which will be provided over three years, allows the college to buy program equipment as well as an outdoor lab. The contribution will help provide the region with the skilled workers it needs to identify and monitor environmental issues.

The program's first class graduated seven new monitors in November 2007 and the program's second year began in February of the same year.

About Keyano College

Originally opened in Fort McMurray in 1965 as the Alberta Vocational Centre (AVC), Keyano was reopened under its current name in 1975. "Keyano", is a Cree word meaning "sharing". The original slogan for the College was "Yours, Mine and Ours."

A timeline of electricity in Alberta

1883

Canada's first single-phase AC generators are commissioned in Calgary by the Bow River Lumber Company and Ottawa at Chaudiere Electric.

1891

The Canadian Electrical Association is formed to represent the industry.

1909

Calgary Power is formed. Later renamed TransAlta, the company develops into Canada's largest investor-owned utility.

1998

Alberta passes the Electric Utilities Amendment Act to begin the process of deregulation by separating the functions of generation, transmission and distribution.

2005

Genesee Unit 3 is completed. The 450 megawatt unit is Canada's first generation facility to use supercritical combustion technology for greater fuel efficiency and significantly lower emissions.

2007

Construction begins on Keephills 3, a 450 MW supercritical coal-fired unit west of Edmonton, Alberta. The facility is another EPCOR - TransAlta joint venture.

It's an old idea that could very well renew the energy industry.

Bioenergy, produced by extracting the energy contained in organic materials, may offer Albertans new renewable energy sources as ancient as fire.

The oldest forms of bioenergy include fires built from "biomass" like wood or dried manure, while modern forms of bioenergy include converting biomass to motor fuel (ethanol, biodiesel and biogas) and electricity. Some of the most readily available biomass include forestry residues from mills and logging, agricultural residues including manure from livestock operations, municipal solid waste and energy crops.

About six per cent of Canada's energy needs are met by bioenergy, and that number could be much higher, according to the Canadian Bioenergy Association (CBA), driven as much by economics as environmental concerns.

"Up to this point, fossil fuels have been a readily available source of energy," says Harvie Campbell, Executive Vice-President of Strategy and Development at Pristine Power Inc. "But fossil fuel prices have gone up and bioenergy isn't looking quite as expensive any more. Green energy isn't just a good idea, it is becoming economically viable."

To encourage the further expansion of Alberta's renewable energy sector, the Government of Alberta has invested more than \$17 million by providing 15 different grants to bioenergy projects in the province. The money will help fund new facilities and research to strengthen the industry in the province.

Alberta's Bioenergy Plan, announced in 2006, helps support the integration of biofuels, biodiesel and biomass-generated power using conventional energy. And though the commitment calls for \$239 million over five years, the government is already praising the program's results.

"Alberta's bioenergy plan has been a remarkable success," says Alberta Energy Minister Mel Knight. "The economic activity, which the grant programs and the Renewable Energy Producer Credit have helped stimulate, is extensive. Approximately \$850 million in new, private investment has been earmarked on the strength of the province's commitment to renewable energy."

Given local energy expertise and the feedstocks provided by agriculture and forestry, notes Matthew Machielse, Director of BioEnergy for Alberta Energy, Alberta can take advantage of the growing trend for renewable energy. There are already five biogas and one ethanol biofuel producing facilities in Alberta, and during 2006 Alberta produced approximately 25 million litres of ethanol.

With calls for sustainable energy sources increasing and a long history of finding fuel in the plants and waste we find all around us, Alberta is ready to embrace an old technology for its future.

Energy from biomass

In their pursuit of renewable fuel sources, some of Alberta's energy producers are going back to nature, because in an industry as complex as energy, sometimes it's hard to see the trees for the forest.

Humans have been using bioenergy since the dawn of civilization, burning wood and other organic materials, like dried manure, to warm themselves and cook their food. Bioenergy generally refers to energy extracted from biomass (organic fuel sources like wood, grain or waste products from cities or agriculture), which, in addition to being renewable is incredibly versatile, with uses including hot water heating and electricity generation.

The most common source of biomass is wood, and it's one that businesses and individuals, especially Albertans, should be using, says Harald Welling, co-owner of Kalwa Biogenics and co-author of a recent Alberta Agriculture report titled "Energy From Wood Biomass Combustion in Rural Alberta Applications."

"Wood is one renewable fuel that Alberta has so much of," he says, adding that many industrial facilities, such as lumber mills, produce organic waste.

Wood heating is a natural energy source in rural Alberta, notes Welling, "It's readily available,

grows around the corner and the need for it is always there."

Some, like Welling and Kalwa Biogenics, argue that wood biomass (trees) absorbs carbon dioxide during growth and emits it back again during combustion. Therefore, they argue, the trees used as biomass recycle atmospheric carbon and do not contribute net greenhouse gases. Also, this kind of fuel doesn't contribute substantially to acid rain as it produces only low levels of sulfur and ash. And nitrous oxide production can be controlled through modern biomass combustion techniques.

But Kalwa concedes that using wood as a fuel source is not entirely CO2 neutral, noting additional CO2 is released as part of the fuel supply chain when the wood is harvested and processed, rather than when the wood rots. Wood harvested for energy also needs to be reforested sustainably to balance the carbon-capture-and-release ratio.

Certainly, bioenergy derived from wood isn't without its controversy, but as a renewable fuel source found throughout Alberta it's one that's piqued energy producers' interests. Some, like Welling, are already re-using an ancient technology in a modern context.

Which begs the question: Wood you?

BIOENERGY IN ALBERTA

BIOFUEL

Biofuel	Feedstock	Facilities	Capacity (million litres)
Ethanol	Wheat	1	40
Biodiesel	Canola	1	225

ELECTRICITY GENERATION

Energy Source	Facilities	Installed Capacities (MW)
Wood Waste	6	233.1
Landfill Gas	1	5
Biogas	5	1.9
Total	12	240



Courtesy of Warren Gretz and DOE/NREL

Coal production is on the rise across Alberta and the province's producers are reaping the rewards.

Thanks to a steady, global increase in demand on the world market that's also responsible for rising prices, it's a good time to be producing coal for export. In 2006, coal production reached nearly 70 million tonnes. And according to Allen Wright, CEO of the Coal Association of Canada, 30 million tonnes of that coal was mined in Alberta.

"Thermal" coal represents the largest segment of Alberta's coal market and is used primarily as a fuel source for electricity generation. Coal Valley, located in its namesake village near Edson, is one of Alberta's main thermal coal mines.

Coal Valley Mine has supplied more than 50 million tonnes of coal to the marketplace since its creation in 1978. In 2004, Coal Valley doubled its mine's production to nearly four million tonnes per year. Now, Coal Valley Resources Inc., is expanding its existing mining operations at Coal Valley to include three adjacent reserves, which when combined will tap into about 55.2 million tonnes. The available coal is expected to sustain production until 2020.

Another market segment, "metallurgical" coal, is also demonstrating increased demand and production. Metallurgical coal, used in the production of steel, is produced by mines Cheviot Creek in Cardinal River near Jasper and Grande Cache Coal in Grande Cache.

With increased demand fuelling further production of thermal and metallurgic coal, producers are enjoying an expansion of the industry. But an increase in production also calls for an increase in labour, which leaves coal producers facing the same obstacles as the oil and gas industry — a lack of skilled workers.

"The oil sands is the area we compete with the most for skills," says Wright. "One of the biggest challenges for the industry is finding skilled labour, particularly when you're competing with skills somewhat similar to those required in the oil sands."

Fortunately for coal producers, changes in transportation technology are improving efficiency and, therefore, the bottom line. Transported primarily over rail lines, aluminum cars are being added to make trains longer and increase capacity, and bigger trucks can carry larger loads — transporting Canada's booming quantity of coal across the country and around the world.

COAL	
COAL RESERVES IN ALBERTA	33.6 billion tonnes, which represents 70 per cent of Canada's total reserves
ALBERTA ANNUAL COAL PRODUCTION	25 - 30 million tonnes
THERMAL COAL MINES IN ALBERTA	6 mines producing 27.4 Million tonnes per year
THERMAL GENERATION IN ALBERTA	8 generating stations with combined installed capacity of 5,893 megawatts

Alberta's coal contains more than twice the energy of all the province's other non-renewable energy resources, including conventional oil, natural gas, bitumen and synthetic crude.



You can continue to participate in this discussion by visiting us online at www.centreforenergy.com to learn more about how Canadian energy affects your daily life.