ELECTRICITY: OUR SILENT PARTNER

POWER FACTS: Appliance costs may surprise you

What’s the long-term plan?
Let us introduce ourselves…

We are the Alberta Electric System Operator, or AESO, and we’re pleased to bring you this magazine to help answer some of your questions about power.

However, we’re anticipating your first question might be about us. That’s what happened in the summer of 2007 when we asked Albertans for feedback about an earlier version of this publication. In this second edition of an ongoing series, we’re providing more information to Albertans. The first version of this publication, which was mailed to homeowners in Edmonton and the Heartland region in spring 2007, is available on our website at www.aeso.ca at About AESO > Our News > Backgrounders.

We’ve been around as the AESO since 2003, but it all started in 1996 when one of our predecessor companies, the Power Pool of Alberta, created Canada’s first competitive market for electricity. The AESO now operates Alberta’s $8-billion wholesale power market, which is like a commodity exchange where companies buy and sell large volumes of electricity.

The AESO is one-of-a-kind in Alberta’s power business. The jobs we do on behalf of Albertans are defined by legislation called the Electric Utilities Act. We operate the wholesale power market independent of industry and we don’t own or operate any power facilities. We are a not-for-profit organization without shareholders or any financial motivation to build transmission lines. Our only motive is to act in the public interest of all Albertans.

Albertans can depend on reliable power every day because our system controllers are constantly balancing the supply of electricity with the demand for power across the province. There’s no leeway when it comes to electricity because it can’t be effectively stored. The instant a stove is turned on, a school lights up or a heart monitor chirps, the power must be there to meet the need.

Our job description also includes the planning and development of Alberta’s transmission system; we added that role in 2003 when we merged with the Transmission Administrator.

Our transmission planners make sure the system is reinforced to keep pace with the demand for power as our population and the economy continues to grow. We create applications for needed transmission facilities and we develop 10- and 20-year transmission plans to provide the kind of power system necessary to meet the needs of Albertans. The transmission business is regulated by the Alberta Utilities Commission.

The transmission network is the backbone of the power system. It’s like a major highway system for electricity, moving large quantities of power from where it’s generated to where it’s needed. We make sure that power generators and industrial customers can connect to the transmission system when they are ready to startup or expand their operations.

Throughout our organization, consultation is a big part of how we do our work. We gather input from Albertans through our information sessions as well as discussions with industry and all levels of government.

Our Board of Directors provides diligent oversight of our public interest mandate and our 250 employees have the interests of their fellow Albertans at the heart of everything they do.

We hope this introduction has provided some answers to your questions about who we are and what we do. We invite you to review this magazine and if you have suggestions or questions, please call us at 1-888-866-2959 or email us at stakeholder.relations@aeso.ca or visit our website at www.aeso.ca.
Escape artist
Every year the average homeowner spends about $40 on electricity they probably don’t even realize is being used. Many devices are always using power, even when they appear to be off, such as garage door openers, cordless phones, televisions, computers and microwaves.

In a flash
Electricity moves at the speed of light—that’s 299,792 kilometres per second. In fact, if the Earth were connected to a power source on the moon, it would only take 1.26 seconds for that power to reach Earth.

Thermal dynamic
Alberta has many large power plants that use coal to generate electricity. About 70 per cent of Canada’s coal reserves are found here. Alberta’s coal has low-sulphur content. We also have many power plants that use natural gas to generate electricity. Some of these plants can produce heat and power from the same fuel in the same plant through a process called cogeneration, which is an efficient use of the gas.

Blow me down
In all of Canada, Alberta has the greatest amount of wind power connected to its system. We were the first province in Canada to develop standards to connect wind power to the transmission system, and the first province to conduct detailed studies on how to forecast wind patterns.

Nowhere to hide
Electricity cannot be efficiently stored. It must be used in the same instant it is produced, which means that supply and demand must always be balanced.

Power costs
Many of the modern conveniences that improve our lives depend on electricity. The following chart provides the average residential monthly power use and cost to help us all use energy wisely. Power is measured in watts. Households consume power in kilowatts, which represent 1,000 watts. A kilowatt hour measures how much power is being created or used over time. Power is normally produced in large volumes called megawatts. One megawatt equals 1,000 kilowatts.

<table>
<thead>
<tr>
<th>Item</th>
<th>Average Use</th>
<th>Average Monthly Cost *</th>
</tr>
</thead>
<tbody>
<tr>
<td>100-watt bulb</td>
<td>6 hrs/day</td>
<td>$ 1.10</td>
</tr>
<tr>
<td>Compact fluorescent bulb with adapter—28 watts</td>
<td>6 hrs/day</td>
<td>.30</td>
</tr>
<tr>
<td>Microwave oven</td>
<td>20 minutes/day</td>
<td>.70</td>
</tr>
<tr>
<td>30” range</td>
<td>2 hrs/day</td>
<td>3.60</td>
</tr>
<tr>
<td>New refrigerator – 18 cu. ft.</td>
<td>Continuous</td>
<td>3.40</td>
</tr>
<tr>
<td>Old refrigerator – 17 cu. ft.</td>
<td>Continuous</td>
<td>7.25</td>
</tr>
<tr>
<td>Dishwasher – heat, dry cycle</td>
<td>1 load/day</td>
<td>1.10</td>
</tr>
<tr>
<td>– no heat, dry cycle</td>
<td>1 load/day</td>
<td>.60</td>
</tr>
<tr>
<td>Clothes dryer</td>
<td>8 loads/week</td>
<td>4.25</td>
</tr>
<tr>
<td>Christmas lights</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– 25 lights/7-watt bulbs</td>
<td>4 hrs/day</td>
<td>1.25</td>
</tr>
<tr>
<td>– 70 LED lights, 4-watt strings</td>
<td>4 hrs/day</td>
<td>.04</td>
</tr>
<tr>
<td>Car block heater – 650 watts</td>
<td>4 hrs/day</td>
<td>3.50</td>
</tr>
<tr>
<td>Outdoor hot tub</td>
<td>8 hrs/day</td>
<td>27.00</td>
</tr>
<tr>
<td>Heating pump</td>
<td>8 hrs/day</td>
<td>5.40</td>
</tr>
<tr>
<td>Computer and printer</td>
<td>3 hrs/day</td>
<td>1.25</td>
</tr>
<tr>
<td>Television – 26” colour</td>
<td>4 hrs/day</td>
<td>1.45</td>
</tr>
<tr>
<td>Video game system with TV</td>
<td>2 hrs/day</td>
<td>.75</td>
</tr>
<tr>
<td>Ceiling fan</td>
<td>6 hrs/day</td>
<td>1.30</td>
</tr>
<tr>
<td>Humidifier – portable</td>
<td>6 hrs/day</td>
<td>1.10</td>
</tr>
<tr>
<td>– on furnace</td>
<td>Normal cycle</td>
<td>.90</td>
</tr>
<tr>
<td>– ultrasonic</td>
<td>6 hrs/day</td>
<td>.45</td>
</tr>
<tr>
<td>Space heater – 1,500 watts</td>
<td>6 hrs/day</td>
<td>14.60</td>
</tr>
<tr>
<td>Furnace fan</td>
<td>Normal heat cycle</td>
<td>3.95</td>
</tr>
</tbody>
</table>

* To calculate the actual operating costs of appliances, use the following formula:
1 kilowatt hour = 1 kilowatt used for 1 hour
1 kilowatt = 1,000 watts

Wattage x $0.06 = cost per hour
**MOVING PARTS**

**Electricity at work**

**Generating plants**

Power is generated using a fuel source to create a rotating motion, which is then turned into electricity.

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**Alberta’s power sources**

- **Coal:** 5,893 megawatts
- **Gas:** 4,635 megawatts
- **Hydro:** 869 megawatts
- **Wind:** 497 megawatts
- **Other renewables:** 178 megawatts

(E.g. biomass, solar, run-of-river hydro)  
(February 2008)

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**How electricity is generated**

- **Natural gas-fired generation:** A gas turbine is like a jet engine. Air is brought in and compressed, then heated by burning natural gas. The high-speed rush of this hot air spins the turbine which causes a generator to turn and create an electrical current. In some plants exhaust from the gas turbine is run through equipment that extracts the heat, which can then be used for another purpose. In a cogeneration power plant, extracted heat is used to produce steam, which can be used in an industrial process in an adjacent facility, or it can be used to generate additional electricity in a steam turbine. This is an efficient use of the natural gas.

- **Coal-fired generation:** Coal is burned in furnaces to heat water. Boiling water creates steam, which travels through pipes into a turbine. The turbine spins the generator, creating an electrical current.

- **Wind power:** A turbine is placed on top of a high tower. When the wind blows, the turbine blades turn, which turns a shaft attached to the blades. As the shaft turns, it spins the generator, which makes electricity.

- **Hydroelectric power:** The force of falling water created by dams pushes against turbine blades causing the turbine to spin, which spins the generator and produces electricity. Hydroelectric power is also generated in run-of-river plants, which use rushing river water to turn turbines that generate electricity. Some of these plants are integrated into irrigation watering systems.

- **Solar power:** When sunlight hits solar cells, or photovoltaic cells (thin metallic plates) electrical currents are created which produce electricity. Solar panels can be installed on roofs of houses, office towers, barns and other buildings to supply electricity.

- **Biomass power:** Examples of biomass are trees, grasses, plants, crops, animal manure and even garbage and landfill fumes. A biomass power plant can use these fuels in a furnace to boil water which creates steam. The pressure of the steam spins a turbine attached to the generator, which creates electricity.

- **Nuclear power:** A nuclear reactor produces heat by splitting uranium atoms through a process called fission, which creates a lot of heat. This heat boils water in the reactor to create steam. The steam spins large turbines that drive the generators to produce electricity.
**Transmission substation**
A set of large transformers increases the voltage of power coming from a generating plant for its long journey through the transmission grid to customers. Voltage can be compared to water pressure in a hose.

**Transmission line**
Transmission is the backbone of the electrical system, moving power from where it’s generated to where it’s needed in our homes, farms, businesses and industry. Towers and poles support sets of high capacity wires. Transporting power at higher voltages is best over long distances because this reduces line losses. Electrical current creates heat on a power line; this heat is ‘lost’ energy as it doesn’t reach the customer. Typically, two to five per cent of the power entering a line is lost due to the resistance created as electricity moves along the line.

**Intertie**
Connections with neighbouring electric systems act like a valve, which can be opened and closed, allowing power to move in or out of the province.

**Industrial customer**
Industry uses about 60 per cent of Alberta’s total electricity supply, which is why some companies build their own power sources to support industrial operations such as steel mills, forestry and petrochemical processing plants. When Alberta needs more power, some industrial customers can send their extra energy onto the power system.

**Distribution substation**
Power lines enter the substation, where a transformer reduces the voltage to a lower level that can be safely carried on distribution power lines that will deliver electricity to homes, farms and businesses.

**Power meter**
The amount of electricity delivered to a home, farm or business is measured using a meter.

**Distribution line**
Low voltage power lines are best suited for transporting electricity over short distances. These power lines carry electricity from a substation to homes, farms and businesses.
Electricity: our silent partner

In days gone by, people were surprised at how electricity could save their time and effort. Today, we take electricity for granted.

It's invisible and yet we need it for almost everything we do. We don't think about it for even a moment and yet it would be virtually impossible to live without electricity.

If we did take a minute to think about it, we'd discover that it's a big part of our day from the time we open our eyes to the sound of our alarm in the morning, to the last light we switch off at night. Even while we're asleep electricity keeps on working for us. It keeps our home warm, our food fresh and our family safe in the dark with low-wattage night lights.

Electricity is in the background helping us as we cook our meals, wash our dishes and dry our clothes. With the flick of a switch we light our homes and power our entertainment. If you live in the country, electric pumps may also control your water supply.

Electricity is quietly powering our TVs, DVDs and computers so that everything is on in an instant. We don't even need to wait for things to warm up anymore.

We don't have to look very far, or think very hard to see electricity at work powering our lives every day. Practically everything today relies on electricity and yet most people know so little about it – how it's made, how it moves, how it works and who's involved. The AESO hopes to answer these questions about electricity as our 'silent partner in everyday living' in this and subsequent issues of Powering Albertans magazine.

Additional information is also available on our website at www.aeso.ca or you can email us at stakeholder.relations@aeso.ca or call us at 1-888-866-2959.
Using energy wisely

There are many things we can do to use energy wisely. One of the easiest things to do is turning lights and other appliances off when we’re not using them. We’ve gathered a few tips to help you use energy wisely.

- Install motion sensors to turn lights on and off automatically.
- Use a programmable furnace thermostat to reduce energy use when you’re not at home.
- Install blinds or curtains on windows to keep your home cooler in the summer and warmer in the winter.
- Use timers on Christmas lights and car block heaters instead of using power all night.
- Replace worn weatherstripping on doors and windows to reduce winter drafts.
- On sunny winter days, keep curtains open to allow the sunshine to help warm your home.
- Use energy-efficient compact fluorescent bulbs which are four times more efficient and last about eight times as long as incandescent bulbs.
- If you use incandescent bulbs, install a dimmer switch; a bulb dimmed by 25 per cent uses 10 per cent less energy.
- Save energy by using small appliances such as a microwave, a slow cooker, an electric kettle or a toaster oven instead of the stove or oven.
- Run a dishwasher late at night and let your dishes air dry.
- Use a clothes dryer late at night, or hang clothes outside to dry on a sunny day.

1930’s modern all-electric kitchen

While it’s hard to imagine our lives today without electricity, there was a time when flicking a switch just wasn’t an option. In fact, in the early 1900’s when electricity was first introduced to Alberta the concept of electric power as something that could be useful was a novel idea. In the 1930’s one power company travelled around the province introducing people to the benefits of electric power. The “Modern All-Electric Kitchen” hit the road with many modern conveniences such as a range, refrigerator, Mixmaster, washer and coffee maker. The first stop was Airdrie, where 40 people, about one-fifth of the town’s population, turned out to see the travelling kitchen.

Alberta’s first transmission lines

Alberta’s early transmission lines were mounted on wooden poles constructed in the shape of an “H”. These lines connected the sources of power to the growing populations in central and southern Alberta.
Electricity transmission starts at the power plant where electricity is generated. A large transformer increases the voltage of electricity so it can travel over long distances on high-voltage transmission power lines.

When a transmission line reaches a city, town, or farm it goes through another substation, which reduces the voltage to a level that is used by distribution power lines to deliver power to homes and businesses.

The entire province has about 21,000 kilometres of transmission lines that operate much like a system of highways. There are major routes that connect large centres and handle a high volume of traffic and smaller, secondary routes that branch out into every community in Alberta.

However, unlike a highway system, the power system must be managed every second. This is done by our system controllers. Operating the system is similar to an air traffic controller’s job of managing the movement of planes at an airport. Our skilled system controllers have sophisticated technology at their fingertips to constantly manage the movement of power, from generators through the transmission network and across the province to make sure that when a light switch is turned on the power is there.

Transmission lines are made of aluminum or copper wire, which have a low electrical resistance. Some heat is always created when electrical current travels through a power line; this is called transmission line losses. The term ‘losses’ is used to describe this energy because it’s used in transmission and doesn’t make it all the way to the customer.

Transmission lines are designed to carry a specific amount of electricity. When a line is consistently operated close to its capacity a significant amount of transmission line losses occur. This is inefficient because a larger amount of the power that enters the line at the power plant isn’t delivered to the customer.

It’s important that the capacity of the transmission system keeps pace with load growth on the system to help maintain reliable power supply to customers. For example, if one transmission line automatically trips offline due to equipment malfunction or a bad storm, other lines can carry the load so there is no power outage to customers. Transmission interties to other jurisdictions are also important for reliability. Turn to page 11 for an article about interties.

There are a number of large power plants located around Edmonton and in northern Alberta. These plants account for nearly half of all the power produced in Alberta. Some of these power plants are being upgraded and new ones are planned. New plants are also expected to be built in other areas of the province. It’s critical to be able to move this electricity from where it’s produced to help meet the power needs of our growing population and economy. Strengthening this transmission backbone between Edmonton and Calgary is critical to moving power supply to central and southern Alberta and providing reliable power to Albertans today and in the future.
Electricity is our silent partner, powering virtually every business and industry and the creation of almost every product we use in our lives today.

- Farms use power to irrigate crops, milk cows and warm chickens.
- Industry uses power to transform wood, metal and petroleum into products that manufacturers use to make cars, computer desks, clothes dryers and coffee makers.
- Businesses use power to keep their stores safe, count their inventory and brew our favourite double-double, grande, extra hot beverage.
- Hospitals use power for equipment that makes it easier to assess and treat patients.
- Medical researchers use power to test for cures.

Electricity: powering our lives

Today, electricity is almost always there when we need it. We don’t have to think about it so we probably don’t until it isn’t there. Even when the power is out for a little while, usually it’s for an obvious reason like a spring storm that drops heavy wet snow and plays havoc with the wires that carry the power to our homes. It’s often a short inconvenience.

The interesting thing about those wires is that they are the critical part of a complex system connecting the power that’s generated to the people who need electricity for nearly everything we do every day.

When an economy is growing at the rate of Alberta’s, the need for power grows right along with it. Every year, we are adding the equivalent of two cities the size of Red Deer (86,000 people) to Alberta’s power system.

During the past five years, the peak demand for electricity, which is the maximum amount of power used in any one hour during the year, has grown an average of 2.5 per cent every year (over the past five years) for a total of 13 per cent.

Peak demand in Alberta typically happens in the winter. Fewer daylight hours, increased lighting and cold weather all contribute to push demand to record levels. Albertans have consumed an average of 3.2 per cent more power every year (compared to the previous year) in the last five years, for a total of 17.2 per cent.

To keep pace with this remarkable growth, we’ll need more plants to generate more power and more wires to move the power to customers. It’s not one or the other; it’s both.

It can take between 18 months and three years to plan, acquire approvals and build some types of natural gas or wind power generators. For a coal plant the time required to plan, acquire approvals and build can be between four and five years, while it would typically be 10 years or more for a large hydroelectric or nuclear power plant. But that’s only one part of the story. The power needs to be transported to customers and it can take between five and eight years to plan, acquire approvals and build a new transmission line.

And that’s not all. Alberta’s power generation is a competitive business. Companies that build power plants have to consider a number of things when deciding where and when to build a new plant. They think about how to finance their project, the cost and availability of labour, and the fuel they use to produce electricity.

Today in Alberta, that could be one of many fuels, such as coal, gas, biomass, water or wind. Companies also have to make sure they can get their power to the people who will use it.

They need to get it there efficiently and at a reasonable cost because they are competing against other companies trying to do the same thing. That is where transmission comes in.

(continued on page 8)
There's one more thing.

Power plant developers aren't just looking at all these factors in Alberta. Many of these companies have operations around the world and they are watching for the best investment opportunity on the planet, not just in our province. So if the financing, labour, fuel and transmission aren't quite right, companies might choose to invest in power plants in another province or even another country.

It's easy to see that having transmission lines in the right place at the right time is a critical link to delivering the power that we depend on. Who's taking care of all that? It's the AESO's job to make sure that long-term plans, which look 10 and 20 years into the future, are developed so that Alberta's transmission system keeps pace with the need for reliable power.

As a not-for-profit organization that doesn't own or operate any power equipment; that has no financial investment in the industry, the AESO is driven by a public interest mandate to make sure that the system for keeping the lights on serves the needs of Albertans today and in the future.

Taking anything for granted can be a tricky proposition. It's hard to imagine years ago when power companies were travelling around Alberta with a van full of new fridges, washers and Mixmasters to show people the benefits of using electric power. It's even more difficult to imagine how our day would start and end without power.

The experts say Alberta's growth isn't likely to slow down any time soon. Does that mean we'll need more power? Yes. Does that mean we'll need more power plants and more transmission lines? Yes. Does that mean we can all do our part by using energy wisely? Absolutely. Does that mean we'll all continue to have power at the flick of a switch? That's the plan.
The two main types of electricity are alternating current, known as AC, and direct current, known as DC. The difference between alternating current and direct current systems is in how the power moves through the lines. With an alternating current the flow of power reverses direction – actually 60 times per second, but with a direct current, the power will only move in one direction. Both technologies were developed around the same time, but alternating current has become the predominant system in use. Alberta’s transmission system has been built to work with the alternating current generated at our power plants. To connect an AC system to a DC system, a converter station must be built. These converter stations require additional infrastructure to be built.

Supply/demand balance
One of the most important things to remember about electric systems is that the supply and demand for power must always be in balance. Electricity cannot be stored efficiently and so it must be used at the same instant it is produced. The AESO’s system controllers are responsible for ensuring there is adequate power on the electric system and that supply and demand are in balance at all times.

Load
Load is essentially the demand for power on the electric system. It can be measured for an overall system, or at specific points along the electric system like at a city, town or home.

Peak electricity demand
The power industry uses the term ‘demand’ to define how much electricity is needed and used by customers. The demand for electricity is measured each hour. The highest hourly consumption of electricity during a year is called peak demand. The peak demand for power is reported in megawatts and measures the amount of electricity necessary to serve all Alberta customers during times when they use the most power. In Alberta, the highest hourly consumption of power typically occurs during the dark and cold winter months.

Kilowatt hour/megawatt hour
Kilowatt hours and megawatt hours are the measures of how much power is being created or used over time. The amount of power consumed multiplied by the duration (measured in hours), creates a kilowatt hour or megawatt hour. For example, a lamp that uses a 40-watt bulb and is left on for three hours will use 120 watt hours of energy, which translates to 0.12 kilowatt hours of electricity or 0.00012 megawatt hours.

The average home uses approximately 600 kilowatt hours of power each month and the average farm uses approximately 1,800 kilowatt hours per month.
Alberta was an electricity island until the early 1950’s. Before that time the entire electric system was separate from the rest of North America, which meant we needed to produce all the electricity Albertans used.

Compared to other jurisdictions, Alberta is currently one of the least interconnected jurisdictions in Canada. Alberta’s two interties were built to import or export approximately 1,150 megawatts of electricity. This is about enough power to supply 10 cities the size of Red Deer, a city of about 86,000 people.

Interties play a key role in maintaining a safe, reliable and economic power system and an openly competitive market, but their importance can be misunderstood. Here are answers to some of the most common questions about interties.
Alberta’s power connections

WHAT are interties?
Interties are transmission system connections between neighbouring electric systems. They consist of high-voltage transmission lines and other transmission system equipment.

DOES Alberta have interties?
Alberta has two interties – one with B.C. and another with Saskatchewan. These two interties provide Alberta with access to the entire North American electric grid.

HOW do interties work?
Interties work much like a valve; they can be opened and closed to control how much electricity flows through. When the valve is opened, power flows in or out, depending on whether the electric system has an excess or shortage of power to meet its current demand. Like other parts of a transmission system, interties are built to handle a specific volume of power. The amount of electricity that moves through the intertie is limited by the capacity of the line as well as the ability of the connecting power system to supply or use the power. The ability to transfer power on the intertie is also affected by the capability of the electric systems that are connected to the intertie. During times of high demand, the capacity of a power system may be limited and less power can actually flow through the intertie.

WHO operates the interties?
Power system operators like the AESO are responsible for ensuring there is adequate power on the electric system at all times. The AESO’s system controllers, in cooperation with operators in B.C. and Saskatchewan, schedule and monitor the flow on the interties 24 hours a day, seven days a week.

HOW do we benefit from interties?
There are many reasons to have interties. The supply and demand for power within an electric system must be constantly balanced. Interties are an integral part of ensuring this supply/demand balance is achieved. Interties allow us to have immediate access to power from our neighbours and to obtain assistance in emergency situations, such as when outages occur at power generators or when a severe storm has caused equipment failures. We also support our neighbours by providing power to help them in emergency situations. Interties are beneficial for a competitive market because they allow power to be imported when the electricity can be purchased at a lower price from another jurisdiction, or when our existing system does not have enough electricity to meet demand.

Interties can also help to make a region more attractive for investment. For example, knowing that connections to a large market are available for selling excess power above Alberta’s needs is important to a power developer deciding where to build a new plant. The AESO will meet the legislated requirement to increase the capacity of Alberta’s existing interties to allow for additional imports and exports and to facilitate the competitive market.

For the past five years, Alberta has imported more power than it has exported, reaching over one million megawatt hours in 2007.

ARE there plans to build new interties for Alberta?
The AESO is studying the benefits of new interties for Alberta’s market and system reliability. There are also two proposed merchant transmission lines being advanced. Montana Alberta Tie Ltd. is proposing one line from southern Alberta to Montana, while TransCanada is proposing the NorthernLights project, which will run from northern Alberta to northern Oregon in the U.S. Should these lines be built, the project developers will be responsible for construction costs. The developers will look to recover their costs from companies who will pay to use the line to transport power. We make sure these projects are reliably connected with Alberta’s existing transmission system, and we are responsible to identify any direct benefits that could be delivered to Alberta as a result of the interconnections.
Running an electric system involves thousands of decisions and millions of moving parts. In fact, the North American electric system has been described as the largest and most complex machine in the world. As part of this larger interconnected grid, Alberta’s power system must be able to respond to instantaneous changes in the supply and demand for power at any given moment. Our system controllers balance generation supply with the demand for power every second of the day, 24 hours a day, 365 days a year. We hope this article helps to answer some of your questions about Alberta’s transmission system.

Who’s got the big picture in mind?
The AESO monitors how the power system is working 24 hours a day, seven days a week, 365 days a year. We also have the complete picture about how the system needs to be reinforced to make sure power can be transported to light our homes into the future.

We don’t build, own or operate any of the power facilities. We’re a not-for-profit company. Our motivation is to do what’s in the best interest of all Albertans.

What’s the long-term plan?
Over the last several years the province has grown at an astonishing pace; matched by an increasing demand for electricity. While the regional transmission system has been reinforced, there has only been one major transmission line built in the last 20 years; it is located between Fort McMurray and the Edmonton area. Alberta’s backbone, or major transmission system, requires reinforcement and expansion to continue providing power efficiently and reliably to meet the needs of the province’s growing population and flourishing economy.

Transmission is also essential for a competitive power market. We need transmission to deliver power to customers and if it can’t be built in time to connect new generators then investors may decide to build their power plants or wind farms somewhere else.

Why is it so important to build transmission now?
Over the last several years the province has grown at an astonishing pace; matched by an increasing demand for electricity. While the regional transmission system has been reinforced, there has only been one power plants. By analyzing different scenarios for where and when new power plants might be built, our planners are able to see how well the transmission system can handle the new demands. They can pinpoint where the system is weak, and where and when it will need to be upgraded in time to address future needs.

Who is in charge of the plan for Alberta’s transmission system?
Since its inception in 2003, the AESO has had the responsibility to plan transmission. Transmission is planned to be in place ahead of any increases in consumer demand or any new investor-owned generation development. While this approach works well to support a competitive marketplace, it does create some challenges for transmission planning.

Some types of natural gas or wind generators can be built in 18 months to three years, but a transmission line now takes between five and eight years to plan and construct. This means that our transmission system planners must look to the future using projections of population and forecasts of economic growth, as well as information from industrial customers about their power needs and from generators about plans for building new
How are other points of view considered in your transmission system plans?

We welcome input from Albertans through our open houses and meetings with community representatives, agencies, industry and all levels of government. We also share discussion papers and draft documents for feedback. Our aim is to consider a range of alternatives. We stay informed about the plans of industry. Our consultation processes and the knowledge and information we gather is critical to helping us ensure that our transmission system is reinforced when and where it’s needed.

What plans are in place for Alberta’s system?

The AESO’s transmission planners create three types of key planning documents to guide the timely development of Alberta’s system.

- The 20-Year Outlook represents the strategic direction for the entire transmission system and is produced every four years.
- The 10-Year Transmission System Plan provides a roadmap for the types of projects that may be required if the most likely scenarios for electricity supply and demand unfold as expected. This plan is updated every two years.
- A Need Identification Document represents a specific recommendation for a particular transmission line or system upgrade. These documents are developed as required and submitted to the regulator for approval.

All of these documents are quite technical in nature and provide a comprehensive analysis of the system needs for the future. We consult with stakeholders when developing these plans and publish them on our website at www.aeso.ca.

How do we know that the power we need won’t be exported on new transmission lines?

Imports and exports are important to Alberta. We depend on imports of power when Alberta generators can’t produce all the electricity Albertans need, and in other situations where equipment breaks down and we need additional supply. Alberta can also import power when it can be purchased at a lower price from another jurisdiction. Alberta has imported significantly more power than it has exported over the last five years. A provincial regulation and policies of the AESO are in place to provide that the interties have the capacity to import and export electricity up to the design rating of the transmission line.

The AESO has procedures in place to ensure that the electricity needs of Albertans are met before exports of power occur. For example, in emergency situations, the AESO’s system controllers will cancel all exports to maintain electricity supply to Albertans. Power exports also help facilitate a competitive power market because they allow generators to sell their excess electricity and that’s an incentive to investors when deciding where to build new power supply.

Who pays for electricity transmission?

The regulator determines how transmission system costs are allocated. Most transmission costs are charged to distribution utilities and industrial customers, based on their use of the transmission system. In Alberta, the transmission facilities that deliver electricity to consumers are owned, built and maintained by companies known as Transmission Facility Owners (TFOs). TFO costs, as well as other costs of planning and operating the transmission system, are recovered through transmission charges paid by all electricity consumers in the province. All consumers – whether industrial, residential, commercial, farm or irrigator – pay for transmission service. Alberta’s transmission system continues to be regulated as it always has. The chart below represents an approximation of how most transmission costs are allocated in Alberta. Generators pay for transmission system losses.

<table>
<thead>
<tr>
<th>Who pays for transmission?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer categories:</td>
</tr>
<tr>
<td>16% Residential</td>
</tr>
<tr>
<td>4% Farm</td>
</tr>
<tr>
<td>19% Commercial</td>
</tr>
<tr>
<td>61% Industrial</td>
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What’s the long-term plan?

In our most recent 2007-2017 10-year plan, we identified the potential need for $5 billion in proposed transmission development to ensure a reliable supply of electricity for all Albertans. This includes projects underway. If all the potential projects examined in this plan are required and built, this investment in critical infrastructure would result in less than a total $7 charge to the portion of a residential power customer’s monthly bill that covers transmission costs. This charge would appear over a period of 10 years as projects are built and come online.

At the time of printing this magazine, the AESO had begun consultation to update its long-term transmission system plan for Alberta. Our analysis identified that to meet the demands of population and economic growth there would be a need for about 5,000 megawatts (MW) of new power supply by 2017 and a total of 11,500 MW by 2027. This represents a doubling of Alberta’s current power generation capacity in the next 20 years.

Changes in consumer demand or the location and types of generation built in Alberta will affect the timing and development of future transmission infrastructure. The potential transmission projects identified in our 10-year plan require further study, consultation and detailed planning before they can be considered for regulatory review.

You can find our 10-year plan and the brochure ‘Planning for Alberta’s power future’ at www.aeso.ca.

If you have any questions or comments about our plans, email us at stakeholder.relations@aes.ca or call us at 1-888-866-2959.
Be part of something you believe in

**OUR PHILOSOPHY**
4-H is young people and adults learning project and life skills, cooperating and having fun together, sharing leadership and learning to do by doing.

**OUR VISION**
Alberta 4-H develops leadership, communication, technical and life skills of 4-H members and leaders to strengthen communities.

**OUR MISSION**
To achieve the 4-H program vision by effectively managing resources.

Make a difference in the lives of our youth

Be a mentor and join almost 8,900 other volunteer leaders who are making a difference in the lives of 30,000 youth across the country.

Don’t just take our word for it – 89 per cent of leaders recently surveyed said that 4-H programs are ‘beneficial or very beneficial’.

There’s a 4-H club in your area looking for a volunteer mentor just like you. Someone who is dedicated to creating an environment of learning, developing a relationship of trust and encouraging a drive to succeed in today’s youth.

It’s easy to get involved, just visit our website:

www.4h.ab.ca/about/leadership.shtml

or call 780-422-4444

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