Planning for Alberta's power future

We keep the lights on, managing the system that delivers power to Albertans every day. We're plugged into the action, contributing to economic growth by providing a fair, efficient and openly competitive market for electricity.

January 2007

At the AESO, our job is to ensure all Albertans receive safe, economic and reliable power today and in the future.

Our company is different than any other organization in the power industry in Alberta. We don't own or operate any power facilities and we don't have a financial interest in the industry. We are a not-for-profit company. What that means is we are driven in all our business activities to plan, develop and operate the power system in a way that is in the best interests of all Albertans.

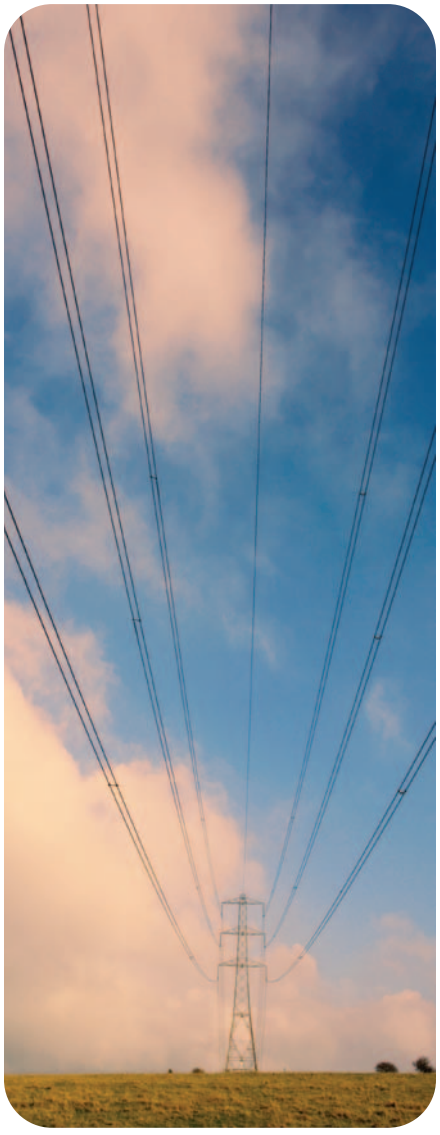
- We manage the coordinated operation of the power grid and make sure that the supply of power is in constant balance with the demand for power across the province.
- We plan the provincial transmission system, including all its interties with neighbouring provinces. We strive to ensure this important infrastructure keeps pace with the growing demand for power.
- We operate Alberta's wholesale electricity market, with 200 participants and about $7 billion in annual energy transactions, ensuring a fair, efficient and openly competitive market for all participants.

Planning today to ensure reliable power in 2016

This brochure has been developed to provide a summary of our most recent 10-Year Transmission System Plan for Alberta. It is helpful to think about our 10-year plan like a roadmap that continues responding to changes in the industry through updates every two years.

The transmission system is a vital component of the power industry and provides the platform for Alberta's competitive wholesale electricity market. The system is like a complex network of major highways and secondary roadways that connect power generators to consumers across hundreds of kilometres of diverse landscape. Our power grid provides the means to deliver electricity reliably and efficiently to consumers across the province under a wide range of system operating conditions.

We take a comprehensive approach to planning and upgrading the provincial transmission system and ensuring that Albertans continue receiving safe, economic and reliable power today and in the future.



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Our planning approach includes detailed technical reports and studies to ensure the power grid is reinforced in a way that keeps pace with Alberta's requirement for power. We develop the following in-depth reports that are broadly available: a 20-Year System Outlook, a 10-Year Transmission System Plan and separate project-specific Need Applications for every proposed transmission development.

The 10-Year Transmission System Plan is created using forecasts detailing the need for power in the next 10-year period, as well as information about new generation being planned or developed. We study several scenarios describing how generation might be developed over the period and then we test the adequacy of the transmission system against those scenarios. Stakeholder consultation is an important part of developing the 10-Year Transmission System Plan and generators, transmission facility owners, municipalities and other industry groups provide feedback during its development. Consultation is an important element in developing our major planning documents as well as our project-specific Need Applications.

We create a new version of the plan every two years to update the previous 10-year plan and incorporate any new information that has become available. Our first 10-year Transmission System Plan was released in December 2004.

KEEPING PACE WITH ALBERTA'S GROWTH AND DEMAND FOR POWER

Since 1998 power use in Alberta has increased by about 3,500 megawatts (MW), or 35 per cent. In contrast, the transmission system has not had a significant upgrade since the 1980s. The only new major transmission line in Alberta in about 20 years was built from Fort McMurray to northeast of Edmonton (Dover to Whitefish line) by ATCO Electric in 2004.

The demand for electricity is correlated with the growth in gross domestic product (GDP) and Alberta has seen a 16 per cent increase in GDP between 2001 and 2005. In fact, the need for power in the province has grown at a rate equivalent to adding more than two cities the size of Red Deer each year. If demand and growth continue as forecast, the addition of up to 3,800 MW of new generation may be required by 2016.

Plan identifies potential for $3.5 billion investment in transmission

Our 10-Year Transmission System Plan reflects current and expected growth patterns in Alberta, both in terms of the need for power and the potential development of new generation over the period. If growth develops as forecast our plan could see the potential need for $3.5 billion in proposed transmission development to ensure a reliable supply of electricity for all Albertans. This is in addition to about $1.2 billion in transmission development projects already approved and underway. If all the potential concepts examined in the plan are required and built, this investment in critical infrastructure would result in less than a $5 charge to the wires portion of a residential power customer's monthly bill.

Changes in the location, types of generation in the province, as well as consumer demand, will affect the timing and development of future transmission infrastructure.

It is important to note that the potential concepts identified in our 10-Year Transmission System Plan require further study, consultation and detailed planning before they can be considered for regulatory review. In our work to plan and appropriately develop Alberta's transmission system we consider a number of important factors, including a high-level assessment of the social and environmental impacts, overall land use, economics and technical performance. Detailed information about these factors is taken into account by the transmission facility owners in determining the specific route or location of new facilities.

What makes Alberta's industry unique?

Power in Alberta is supplied under a different market system than in other Canadian provinces in that the generation and retail sale of electricity are open to competition and transmission is regulated. Transmission system planning in an environment of market-driven generation and competitive retail operation presents unique challenges.

In Alberta's power industry, generating facilities are developed by investors responding to current and expected market conditions, not just in this province but across North America. It's our job to ensure that appropriate development of Alberta's transmission facilities occurs to connect power generators when and where they decide to build. Since lead times are usually longer for transmission than for generation, effective transmission planning is critical to ensure the reliable and economic operation of the system. We work closely with the companies who build and operate Alberta's transmission facilities and others who are developing privately-owned or merchant transmission projects in Alberta. Planning and managing the electric system from a single point is important, because what happens at one location on the grid has an affect on the entire system. Planning must be done with the entire power system in mind.

KEY OBJECTIVES OF THE 10-YEAR PLAN

THE PLAN IS PROACTIVE

Our plan presents proactive concepts for potential transmission development. The plan satisfies both growth in demand and generation development needs. Our plan facilitates a competitive wholesale electricity market in Alberta. In developing our plan we make prudent assumptions about electricity demand and generation development for the 10-year period. Our plan also recognizes the important role interties with adjacent jurisdictions play in facilitating a competitive market and ensuring reliability.

A robust transmission system is one of the key factors that attracts new power generation supply and investment into a marketplace. This is achieved by assessing the current and future needs of market participants and the requirements to meet these needs.

THE PLAN IS FLEXIBLE AND ADAPTABLE

Our plan addresses uncertainties about the load forecast and the size, location and timing of new generation. The plan provides suitable potential options to accommodate a range of generation scenarios while meeting reliability requirements. Our plan allows for transmission development to be implemented in stages to achieve the full capability incrementally rather than all at once.

THE PLAN IS PRUDENT

Many transmission projects have long lead times and represent a significant investment. Because of this, we seek to balance the risks of underbuilding and overbuilding the transmission system in developing our plans. We do this by ensuring that decisions are timely and economic while delivering the certainty market participants desire.

"Power as a commodity has unique characteristics that must be considered."

Considerations for power grid planning

Some of the considerations that our transmission system planners must consider in reinforcing Alberta's power grid includes:

LACK OF STORAGE CAPABILITY

Large quantities of electricity cannot be stored or banked. This means power must be used at precisely the same moment as it is created, and often the physical distance between the location where electricity is created and the homes, farms and businesses where it's used can be significant. In Alberta, this means that electricity may need to travel hundreds of kilometres.

LINE LOSSES

As electricity flows through the wires some of the power is used up as a result of the heat that it generates. This is called transmission line losses. The higher the voltage that power is transmitted at, the lower the level of losses that occur. This is one of the key reasons that different systems are used for the transmission and distribution of power. Transmission involves moving power in large quantities from the places where it's produced closer to the homes, farms and businesses where it's needed. Distribution involves moving power from transmission facilities directly into homes, farms and businesses.

INTERCONNECTED POWER GRIDS

The entire electric system, or grid, is connected and it must maintain the same frequency in order to operate correctly. In the case of Alberta, our system is connected through B.C., to the Pacific Northwest U.S. all the way into northern Mexico. Through Saskatchewan our system is connected to the mid-continental U.S. market. The system is a complex network of thousands of kilometres of transmission lines and other facilities. The grid is like a major network of hundreds of highways that are also connected to hundreds of secondary roadways. This level of interconnection allows different areas to share resources and support each other in times of need.

LOCATION, TIMING AND RATE OF GROWTH

During the 10-year study period demand on the system is forecast to grow at an annual rate of between 2.5 and 3 per cent. There is some expectation that the demand may grow at a faster rate. In addition, continued high demand for oil is expected to drive considerable development in the Fort McMurray oilsands area. This could increase demand on the system by about 2,000 megawatts or more.

AMOUNT AND LOCATION OF NEW GENERATION

New power generation directly affects demand on the transmission system. Potential additional generation in the Lake Wabamun, Fort Saskatchewan and Fort McMurray areas would increase the demand on the system moving power north to south (from the Edmonton area south to Calgary). Meanwhile, the potential for additional generation, (primarily wind power with some coal-fired generation) in southern Alberta would increase the demand on the system moving power from south to north as far as Calgary.

It's our job to operate, plan and expand the transmission system in a way that Albertans can count on power being available when they need it to light and heat their homes, farms and businesses.

Powering Alberta's growth

Each of us is affected in different ways by Alberta's growth. In many communities across the province more roads, schools, hospitals and homes are needed because of the number of people moving to Alberta to pursue new opportunities. The need for power goes hand-in-hand with the development of new infrastructure that's required to keep pace with the rate of growth in Alberta.

It's our job to operate, plan and expand the transmission system so that Albertans can count on electricity being there when they need it to light and heat their homes, farms and businesses. It's our job to make sure power is reliable.

Hand-in-hand with reliability, it's also our job to make sure Alberta's power system is safe, efficient and cost effective. We don't do that alone. We work closely with other companies that own and operate generators and transmission and distribution power lines.

"Power you can count on takes careful planning."

Highlights of the 10-year plan

Our 10-Year Transmission System Plan describes potential concepts for upgrades to the system that were created following study of the current grid, the operating environment as well as scenarios for power generation development and forecasts for energy needs in the province. Changes in the plans of generating companies, or industrial operations using power on a large scale, can have significant affects on the need for transmission facilities.

The potential upgrades described as concepts in the 10-Year Transmission System Plan would undergo further in-depth study, public consultation and regulatory review before being assigned to a transmission facility owner to develop a detailed facilities application. This stage also includes public consultation and regulatory review by the Alberta Energy and Utilities Board (EUB).

The key points outlined in the 2007-2016 version of the 10-Year Transmission System Plan have been summarized on the following pages. If you would like detailed information please refer to the plan, which is posted on our website: www.aeso.ca. Copies are available by contacting the AESO's Stakeholder Relations at stakeholder.relations@aeso.ca

ALBERTA'S GENERATION CAPACITY

Alberta's installed generating capacity at the end of September 2006 was 11,497 megawatts (MW). This included:

- *5,840 MW of coal-fired power*
- *4,278 MW of gas-fired generation*
- *869 MW of hydroelectric power*
- *510 MW of wind and other sources*

The most significant changes in generation capacity since the 2004 10-year plan were the retirement of the four Clover Bar generating units (629 MW) and Wabamun 1 and 2 (130 MW) and the addition of the Genesee 3 unit (450 MW).

Bulk transmission system development concepts

The bulk system is the backbone of Alberta's electric grid. It is the system that moves power from areas of the province that have surplus generation to other areas where demand for electricity exceeds supply. It is like a system of major highways and consists of high voltage power lines and other facilities. The bulk system also connects Alberta to the power systems of Saskatchewan and B.C. through interties.

There are about $600 million (in 2006 dollars) in bulk transmission projects approved and underway. This includes the conversion of an existing transmission line from 240 kilovolts (kV) to 500 kV. The line connects the Keephills and Genesee power plants west of Edmonton to a substation near Ellerslie on the southeast edge of the city. The current cost estimate for this project is $69 million. Another major project underway is a new 500 kV transmission line between Edmonton and Calgary ($528 million). These two integrated projects will enable additional power generation in the Wabamun area west of Edmonton to connect to the grid, provide needed transmission capacity for power customers from Red Deer south and will reinforce the system serving the Calgary area.

The following major new additional bulk system facilities would be needed under all the 10-year generation development scenarios studied. All estimates are in 2006 dollars.

- A second new 500 kV transmission line between the Edmonton and Calgary areas at an estimated cost of $400 million to continue providing reliable power to customers Red Deer and south.
- Replacement of an existing 240 kV single circuit line with a 240 kV double circuit line between the Peigan substation near Lethbridge and Janet substation near Calgary.

Alberta's bulk transmission system

Depending on how power generation and demand scenarios unfold, additional bulk transmission facilities could be required. For more information about these concepts please refer to a copy of our 10-year plan.

Key points

- Upgrades to the entire bulk system would be necessary to meet the needs of Albertans by 2016.
- An estimated investment of $1.5 billion would be required if these facilities were built to address the supply and reliability challenges noted above.
- A joint Alberta-B.C. task force is currently reviewing options to increase intertie capability between the two provinces.
- We are aware of two merchant transmission line projects that would transport power between Alberta and the U.S. The financial risk for developing a merchant transmission line is the responsibility of the project proponent, not Alberta ratepayers. Our job is to make sure that any competitive, merchant line is integrated into the Alberta system in a way that's reliable. We work closely with merchant project sponsors. We will also consider potential opportunities to work with a merchant line proponent in areas where it would provide benefits for the Alberta power grid.

TRANSMISSION SYSTEM CONNECTIONS WITH OTHER MARKETS

Alberta's transmission system provides access to the entire North American power grid through transmission lines called interties with neighbouring provinces. These interties perform an important function because power systems that are interconnected can support each other in situations when severe storms can cause short-term equipment failure. Interties are also an essential part of a competitive market, allowing companies to import power during times of need and export power that is excess to the needs of Albertans. Alberta's system has two interties – one with B.C. and another with Saskatchewan.

The intertie to B.C. consists of 500 kilovolt (kV) and 138 kV transmission lines. The Alberta-B.C. intertie is rated to import up to 1,200 megawatts (MW) and export up to 1,000 MW of electricity. However, because Alberta's transmission system has not been significantly upgraded during the last 20 years existing transmission lines are moving more and more power to keep up with growing demand for electricity within the province. Many existing transmission lines are operating near their capacity and in some areas this limits the amount of power that can be transported along the lines for export through the intertie. In some situations it can also limit how much power can be imported through the intertie and then transmitted on the lines inside Alberta.

Alberta's second intertie to Saskatchewan is a smaller direct current line. The Alberta-Saskatchewan intertie is designed to import and export 150 MW. Currently this intertie can import 150 MW and export 60 MW. This is limited until Alberta's power grid is reinforced and can move more power to the intertie.

Alberta's regional transmission planning areas

Regional transmission system development concepts

Alberta's regional transmission system is separated into six regions and allows electricity to move off the bulk system and toward distribution centres. It is like a system of secondary roadways and should not be confused with the distribution system, which uses lower voltage power lines after electricity has already reached the area of the consumer. All estimates in this section are in 2006 dollars.

SOUTH REGION

The South region of Alberta is located above the Canada-U.S. border north to Calgary and to the B.C.-Saskatchewan borders. Demand for electricity in the region is expected to grow at 1.6 per cent each year until 2016.

Key points

- The existing South region transmission system would need additional reinforcement into the Calgary region before it could accommodate new generation, particularly the large volume of wind power being planned. In addition, the overall region would require additional transmission, in particular in the southwest area.
- Our ultimate objective is to integrate as much wind into the Alberta system as feasible without compromising system reliability or the fair, efficient and openly competitive operation of the market.
- The Alberta-Saskatchewan intertie is managed as part of this region and is currently operating below capacity. The intertie is rated for 150 MW; however, it is presently limited to exports of 60 MW due to constraints on the system inside Alberta.
- An estimated investment of between about $280 and $500 million would be required if facilities were built to address the supply and reliability challenges noted above.

CALGARY REGION

The Calgary region represents the area surrounding and including the City of Calgary. Demand for electricity in the region is expected to grow by 2.6 per cent each year until 2016.

Key points:

- Additional reinforcement of the transmission system between the South region and the Calgary region is important for ensuring reliability up to 2016.
- Within the next 10 years the transmission facilities owned by ENMAX Power require major maintenance or replacement.
- The City of Calgary continues to grow. As a result, the city will require upgrades to existing substations and the addition of new substations as well as the transmission lines that serve them.
- An estimated investment of between about $140 and $170 million would be required if facilities were built to address the supply and reliability challenges noted above.

CENTRAL REGION

The Central region spans the province east to west between Edmonton and Calgary. Demand for electricity in the region is expected to grow by 1.5 per cent each year until 2016.

Key points:

- Transmission development would be required in the Red Deer and Lloydminster-Vermillion areas to support the system reliably.
- We will initiate transmission development studies early in 2007 as a result of the potential for growth in demand due to coalbed methane development in the Hanna area.
- An estimated investment of between about $110 and $145 million would be required if facilities were built to address the supply and reliability challenges noted above.

EDMONTON REGION

The Edmonton region is the area surrounding and including the City of Edmonton. It also includes Wabamun and Fort Saskatchewan. The region is expected to increase its demand for electricity by 2.4 per cent each year until 2016.

Key points:

- The Edmonton region includes Fort Saskatchewan, where several new oilsands upgrader and related facilities are planned and the transmission system will be required to accommodate this increased demand for electricity.
- The City of Edmonton continues to grow. As a result, the city will require upgrades to existing substations and the addition of new substations as well as the transmission lines that serve them.
- The area west of Edmonton is in need of some minor upgrades to ensure reliability.
- An estimated investment of between about $450 and $590 million would be required if facilities were built to address the supply and reliability challenges noted above.

NORTHEAST REGION

The Northeast region covers the upper northeast corner of the province and includes Fort McMurray, Athabasca-Lac La Biche and Cold Lake. Oilsands operations in the area continue to expand and the region is forecast to experience an increased demand for electricity of 7.7 per cent each year until 2016. That represents growth of 30 to 50 per cent during the next 10 years.

Key points:

- The Athabasca-Lac La Biche area system is currently near its capacity due to heavy demand.
- The Cold Lake area system is currently near its capacity due to power transfers out of the area; however, this pressure should be relieved by new local oilsands extraction and upgrader generation projects.
- The Fort McMurray area demands particularly careful watch given its rapid growth and potential to quickly change from being an area with surplus generation for local needs to an area requiring power from other areas of the province to supply local needs.
- An estimated investment of between about $500 and $560 million would be required if facilities were built to address the supply and reliability challenges noted above.

NORTHWEST REGION

The Northwest region covers the upper northwest corner of the province. Demand for electricity in the region is forecast to increase by two per cent each year until 2016.

Key points:

- In 2006 Alberta Energy and Utilities Board approval was received for 700 kilometres of transmission system reinforcements totalling an investment of about $300 million.
- These approved reinforcements will relieve constraints until about 2014 at which time additional development may be needed.
- The timing of additional reinforcement into the Northwest region is dependent on the possibility of additional power generation in the area.
- An estimated investment of about $50 million would be required if the system was reinforced to address the supply and reliability challenges noted above.

Photo courtesy of AltaLink Management Ltd.

We take a comprehensive approach to planning and upgrading the provincial transmission system to ensure that Albertans continue receiving safe, economic and reliable delivery of power today and in the future.

This summary provides an overview of the key points identified in the AESO's 10-Year Transmission System Plan 2007-2016, for detailed information about each area please refer to the plan, which is posted on our website: www.aeso.ca. Copies are available by contacting the AESO's Stakeholder Relations at stakeholder.relations@aeso.ca

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