System Overload

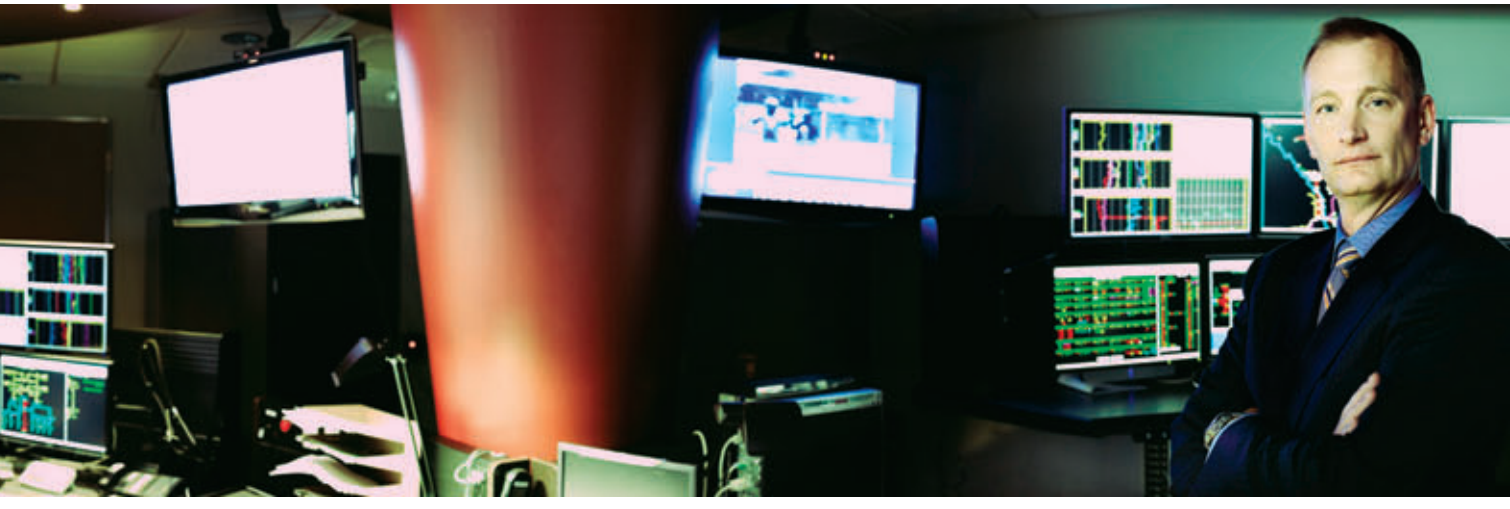
Alberta's power grid reaches a critical juncture

BY DEREK SANKEY | PHOTOS BY EWAN NICHOLSON PHOTOGRAPHY INC.

If the heart of Alberta's economy is the oilpatch, then its backbone is the provincial power grid. Most people don't think twice about it when flicking on a light switch, turning on the television or powering up a computer. Yet, Alberta's $300-billion economy relies perhaps more on electricity than anything. It just has to be there.

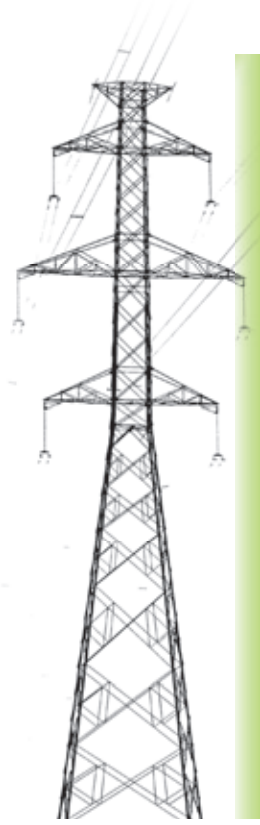
That is why there is growing concern by the people whose job it is to keep the lights on that Alberta is becoming increasingly close – too close – to reaching its limit. Calgary and southern and central Alberta's demand would exceed the maximum amount of power available for use if action isn't taken soon.

Above and below photos: Scott Thon, president and CEO of AltaLink, in the control centre.



"The power grid is really about economic development and the state of the economy," says Scott Thon, president and CEO of AltaLink, the province's largest electricity transmission owner and operator. It's his job to make sure the power gets from where it's produced – mostly in northern Alberta around the Edmonton region – to where it's needed – the rest of the province.

Currently, southern Alberta faces the most pressing need to upgrade its infrastructure to keep up with burgeoning demand. "People don't really see that on a day-to-day basis," says Thon. "That's a big piece we've gotten really behind on in Alberta. We haven't done anything in decades (on building transmission infrastructure). Right now, it's standing as a barrier to new people that want to build new things in Alberta, whether that be oilsands or traditional oil and gas, manufacturing, new wind power – whatever it is."



Scott Thon, President and CEO, AltaLink

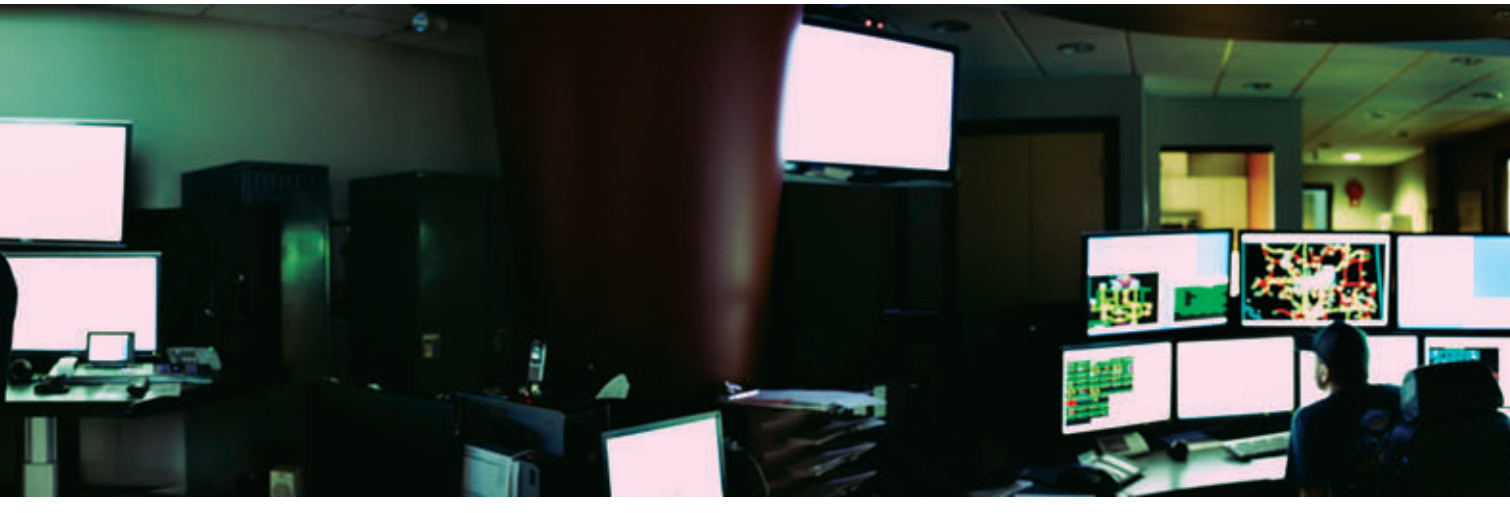
- With $2 billion in assets, 12,000 km of transmission lines and 270 sub-stations, AltaLink is Alberta's largest electricity transmission company, providing transmission service to more than 85 per cent of Albertans.
- Scott Thon is an electrical engineer who graduated from the University of Saskatchewan and later from the executive program of the University of Western Ontario's Richard Ivey School of Business.
- With 25 years of industry experience, Thon was also a member of the inaugural Power Pool of Alberta executive team in 1996 before deregulation of the province's electricity market.
- He is an active member of the board of directors of the Canadian Electricity Association; immediate past chair of both the board of directors of the United Way of Calgary and board of governors for Bow Valley College; a member of the Canadian Athletic Foundation's board of trustees.

The province is now reaching a critical stage. Aging infrastructure cannot keep up to the growing demand on the system. Demand for power has increased 31 per cent since 2000 and on Dec. 14, 2009, hit a record winter peak of 10,236 megawatts (MW). This summer, it hit a record high summer peak on July 18 of 9,552 MW.

"Our load is quite high, but the majority of units are operating at or near maximum capacity, therefore we have adequate supply to meet demand," states Matthew Davis, supervisor of market analytics for the Alberta Electric System Operator (AESO), in a release that day. "We work closely with transmission facility owners and power generation owners to ensure that even during times of high demand, we have procedures in place to meet the electricity demand of Albertans."

That may be true – for now – but the reality, and AESO is well aware of it, is that demand is forecast to grow by 5,000 MW by 2017. One of the crucial links is between the Edmonton region and the Calgary region, including various parts of southern Alberta along the way and beyond to where wind power generation is growing rapidly and needs access to the grid.

AltaLink has a number of potential users lined up – wind power generation companies – that are not just planning to install new wind power projects, but have already secured permits for them or have already built the new turbines. "I can't get him connected (to the grid)," says Thon. "If we can't get power to them, that's just bad for our economy any way you cut it. Wind power is a big part of the grid solution."



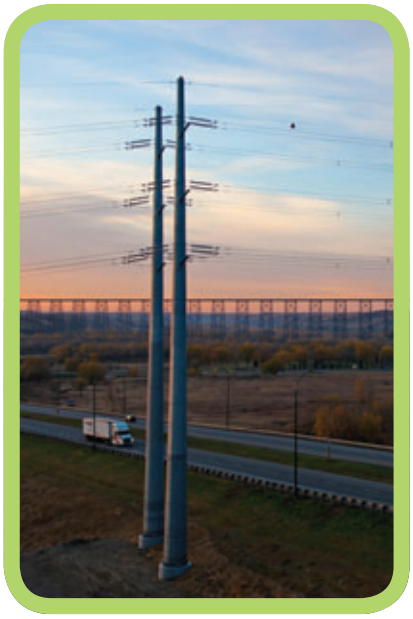
He's awaiting a hearing in November with the Alberta Utilities Commission (AUC) where it will review the final route selection, cost, environmental and various stakeholder considerations, namely landowners. The high-capacity line would run from a generation region just west of Edmonton to a station just east of Calgary, and then out to smaller regions within the local area grid. ATCO is planning a similar one.

AltaLink's proposal was first submitted in 2004 and has been delayed several times. The project came under intense scrutiny and became a controversial issue for many landowners, who repeatedly voiced concerns about health and safety issues, as well as payment for the land and ongoing annual payments to the owners. Now, it appears to be on a different track. The company changed its consultation process and compensation offers.

"Landowners needed to be listened to in a much, much better way," says Thon. "This isn't only a Calgary story ... it's going to be a benefit for all Albertans. Compensation in the power industry has been way behind all the other industries, so we made some adjustments (and) brought ourselves up to the average of all industries."

A 500-kilovolt transmission tower on a landowner's property, for example, went up from $160 in annual compensation to $1,200, in addition to the one-time, upfront payment made for the actual land purchased. AltaLink officials had 4,500 conversations in town halls, community meetings and one-on-one discussions with landowners.

The good news is that operators such as AltaLink, FortisAlberta and ATCO are already working to improve the transmission situation. AltaLink, for example, has been and continues to work on several upgrades to smaller regional systems, such as its Southwest 240 kV line from Pincher Creek to Lethbridge, which opened up 1,000 MW of new wind-generated electricity and other linkages in the grid. But it's the Calgary-Edmonton route that is the largest and most crucial one – not just for Calgary, but all of southern and central Alberta.



240 kV transmission line outside of Lethbridge, Alberta. Photos, these two pages, courtesy of AltaLink.

Thon sees three key issues impacting the provincial grid: reliability, access to renewable energy and diversity in fuels, from clean coal to natural gas to co-generation facilities. Reliability is an obvious requirement – one we sometimes take for granted too often. Access to renewables is needed to continue the move to a greener power future.

"The power grid is the pathway to get there," says Thon. Diversity drives competition because "it's more reliable to rely on 2,000 companies or generators instead of two." It also helps open up non-traditional resources. Currently, the vast majority of Alberta's power is produced from coal-fired generators.

Leigh Clarke, senior vice president of external engagement, says the proposed Calgary-Edmonton line, known as the Western Alberta Transmission Line, will reinforce the backbone of a system that hasn't seen an upgrade in decades. "The

Facts about Alberta's Electricity System:

- No major infrastructure upgrades have been done on Alberta's power grid for 30 years. The largest and most urgent upgrade identified by the Alberta Electric System Operator (AESO) is between Edmonton and Calgary.
- AESO has forecast about 5,000 megawatts (MW) of new generation sources will be needed by 2017 from across all regions in Alberta.
- The City of Calgary peak load is expected to reach about 2,000 MW by 2020.
- Alberta Reliability Standards became effective in 2010 and AESO says load growth in southern and central Alberta is stressing the existing system such that capacity will fall short of reliability requirements by 2014.
- The existing transmission system that delivers power from the Edmonton region to southern Alberta relies on six 240-kilovolt (kV) transmission lines from Edmonton to Red Deer and seven 240 kV lines between Red Deer and Calgary.
- Two high-capacity lines are planned for the Edmonton-Calgary corridor by 2014 – one by ATCO and one by AltaLink – which will both be initially designed for 1,000 MW capacity with expansion to 2,000 MW by 2020.
- The cost for both lines would total about $3 billion.
- Total cost of AESO's provincewide, long-term transmission plan, including 53 projects across Alberta, will cost $13.5 billion by 2020.
- Total cost of the plan would increase the electric bill for an average residential consumer by $11 per month over the next 10 years; industrial consumer rates will increase by $19 per megawatt hour (MWh) over the same period.

SOURCE: ALBERTA ELECTRIC SYSTEM OPERATOR, ALTALINK

Ted Graham, North Transmission Line Crew Foreman, and Josh Krebbs, Transmission Lineman, perform maintenance work on a 240 kV transmission line. TransAlta's Sundance generation plant is in the background. Ted and Josh are retying the overhead protective shield wire. The overhead shield wire protects the transmission line from lightning damage.

Transmission lineman performs maintenance work on a 240 kV transmission line with the assistance of a helicopter.

transmission system connects diverse power sources in the province to the electricity grid – wind, high-efficiency coal, natural gas and others," says Clarke in a release celebrating a milestone for the project – AltaLink's final submission earlier this year to the AUC. "Connecting a mix of power sources keeps the system reliable and helps keep costs low for Albertans," says Clarke.

Demand, meanwhile, keeps going up. Thon makes an apt comparison: "We basically have a system between Calgary and Edmonton that's kind of like your '74 Chevy that you should be thinking of retiring, but instead we're driving it red line all the time." When he looks at Alberta's economy from a purely electricity-consumption perspective, he has no doubt where it's headed. "I can tell you from the lens of electricity, we're back," says Thon.

AltaLink stands between supply and demand. On the supply side, people want less carbon-intensive fuels, but it will take decades before that vision can be fully realized. The federal government has indicated it will likely mandate provinces to reduce coal-fired generation by restricting their emissions to natural gas-fired emissions levels, requiring a switch to new technology or fuels, such as natural gas, for generation.

As demand continues to increase, smart meters and smart appliances will help consumers to better conserve energy, but the province's population continues to increase regardless. Even with solar panels on your roof or a small generator in your basement, the future costs, technological innovations and the speed of development are all relative unknowns, says Thon.

He's more interested in a smart grid. The future relies on more than just transmission. "We need to get the wire in the air," he says. But it also requires a smart, high-speed telecommunications system to control all that power. "The physics of the matter ... is that it moves at the speed of light. I need to first have the physical capacity, but secondly I need to have a really smart, high-speed telecommunications system to control it all," says Thon.

The transmission operators have begun installing smart sub-stations with high-tech IT infrastructure built right in. AltaLink is one of the largest private telecommunications systems outside of the major telcos in Alberta. The firm just moved to a new technology platform that will allow it to control the grid's increasing variability – a major issue to be addressed with more renewables coming online.

Once the system is upgraded longer term, it will be able to handle the inherent fluctuations in generation with unpredictable generation sources such as wind and solar. "The future for me is all about encouraging conservation in the home and finding ways to get better distributed generation, but the bottom line is there's no silver bullet," Thon says. "We need the power grid because it will always operate that integrated web connected all together."

The future grid needs to be built now, he adds, to enable pathways for a better energy system. "We just need to make sure we've got the right grid in place to do it," Thon says, reflecting that the controversy around the Calgary-Edmonton route was misunderstood. It's really about building something that will ensure future power needs are met reliably, cleanly and from a diverse group of sources. "It's really about how to keep the lights on, how to catalyze those renewables and how to keep that diversity. When you get behind all of it, there hasn't been near as much controversy." Meanwhile, Thon will wait along with company officials for a decision in 2012. BiC