Throughout the world, people are facing the reality that electrical power must increasingly come from sustainable sources. That includes the Canadian province of Alberta.

AltaLink – Alberta’s largest regulated electricity transmission company that began operations in 2002 – is at the heart of the province’s transition. With approximately 800 employees working at the company’s headquarters in Calgary – as well as at offices in Edmonton, Red Deer and Lethbridge – the organization is focused on harnessing innovation to enable a future of reliable and affordable renewable energy.

In 2010, AltaLink undertook the biggest and boldest project in its history. At a cost of $1.7 billion, the aim was to create a brand new transmission line to contribute toward a reliable foundation for a future of clean energy. Spanning a distance of approximately 350 kilometres and able to withstand Alberta’s climatic extremes, this Western Alberta Transmission Line (WATL) was designed to connect the energy-rich capital of Edmonton in the north with the thriving business centre of Calgary in the south.

The breakthrough aspect of the 500 kV direct current line would be its ability to deliver a bidirectional power flow. It would handle the traditional source of fossil-fuel-originated power flowing north to south, but most importantly, would also be able to distribute to the north the clean wind power that’s abundant in the south.

In other words, it would be a flexible, reliable tool to sensibly manage the gradual transition toward wind-based power that represents the future of electricity in the province.

In December of 2015, this ambitious vision became a reality when WATL began operating. Making this new era possible is leading-edge ingenuity from Siemens, backed by an unwavering commitment to ensure that no matter what technical and technological challenges were involved in the project, AltaLink would be able to deliver what it had promised to Albertans.
Province of Alberta committed to growth of wind power and other renewables

- Foundational element for that shift is the new Western Alberta Transmission Line (WATL), built by AltaLink, the largest regulated electricity transmission company in the province
- A key attribute of WATL is bidirectional flow of power, with wind power able to be captured in the south and distributed province-wide

Innovative Siemens technology at the heart of WATL

- Two converter stations with leading edge valves and transformers for high-voltage direct current (HVDC) technology enables bidirectional energy flow
- SVC PLUS in one of the converter stations brings high standard of stability and reliability to boost the effectiveness of renewables
- WATL has the potential to deliver an environmental benefit equivalent to taking tens of thousands of cars off Alberta roads

A strong partnership built on trust enabled challenges of project implementation to be overcome

- Labour shortage, harsh weather and tough ground conditions made construction and deploying the technology very difficult
- Close collaboration among one integrated Siemens-AltaLink team committed to success found solutions and kept the project on track for success

**Ingenuity for life with Siemens and AltaLink**

“The showpiece of the project is the valve hall in the converter station. It is a marvel of engineering. It is something to behold the precision of the technology.”

Johanne Picard-Thompson, Senior Vice President of Projects, AltaLink

**The starting point: Choosing a partner for foundational technology**

Johanne Picard-Thompson is Senior Vice President of Projects at AltaLink. She describes how from the beginning it was clear that old alternating current (AC) transmission would not work for what was envisioned. Instead, high-voltage direct current (HVDC) was needed to enable the bidirectional transmission. In addition, DC is more stable and up to 50 per cent more efficient than AC transmission, while also requiring much less land and leaving a dramatically smaller footprint on the environment.

However, to have this new HVDC infrastructure, a major investment was required to create converter stations at either end of the line – one at Sunnybrook near Edmonton in the north and the other at Crossings near Calgary in the south. With great flexibility, these two stations would act as critical linchpins of the system. Existing AC networks could feed into the stations, where the current could be converted into DC. At the same time, when leaving the new line at the other end, the DC power could be converted back to AC, where it could feed back into the existing AC lines in that area.
These converter stations require sophisticated technology, delivering the extreme reliability an electrical utility can count on and the durability to be operational for decades into the future. As a result, AltaLink had one of the most important decisions in company history to make. Knowing there was no margin for error in choosing the right partner for this mega-project, bids were invited in an open tender process.

“There is not a long list of companies that can do HVDC, but Siemens is one of those, and they have done it all over the world,” explains Picard-Thompson. “As one of the bidders on the project they did a great job with the package they offered so we chose them.”

**Leading-edge technology: Leveraging the power of Siemens innovation**

To take the efficiency of HVDC technology to the highest possible standard, Siemens delivered its unique Static Var Compensation (SVC) technology to AltaLink. Siemens SVC PLUS is compact and adaptable, and efficiently manages reactive power needs while boosting dynamic stability and reducing the station footprint.

With a unique, modular and compact design, SVC PLUS is ideal when space is limited and costly. Providing operational advantages like minimized maintenance and service requirements, its redundancy of power modules ensures reliability. And the footprint of a SVC PLUS installation is smaller than a conventional SVC installation of the same rating by up to 50 per cent.

“The SVC PLUS was a big part of the innovation Siemens delivered on the technology side,” says Picard-Thompson. “Having the SVC PLUS with the HVDC is not that common a configuration, so we’re really pleased to be leading the way there.”

The transformers and valves Siemens put into the converter stations, she adds, are powerful symbols of the amazing technology at the heart of WATL.

“The showpiece of the project is the valve hall in the converter station,” she describes. “It is a marvel of engineering. It is something to behold the precision of the technology.”

Nonetheless, as impressive as all that technology is, what might be most innovative in her eyes is simply that the HVDC is being used to have energy flow bidirectionally.

“In most cases that I’m aware of, HVDCs are at big hydro projects and carry the power out in one direction. With our use of it in a renewable context, the power goes in both directions. I think it’s quite innovative that we are showing how the technology really can be used the way it was designed by Siemens – to carry energy in two directions.”
The path to success: Collaboration and trust between partners

It’s one thing to have the promise of great technology and quite another to actually implement it, so Picard-Thompson admits to a little wariness at the start, given not only the magnitude and importance of this project, but also the lack of personal and organizational experience working with Siemens on such a major undertaking. “We had done a bit of business with Siemens in the past but they were not one of our larger suppliers. Overnight, with this HVDC contract, and giving Siemens a turn-key project on the converter stations, they instantly became one of our largest. That is very unusual for such a young relationship.” Despite that, it didn’t take long for her to gain comfort and confidence. “We started right at the top with executive steering teams,” she explains. “I believe those relationships we established were essential, and in the end, they were why we were successful despite many difficult challenges that came along in completing the project pretty much on time.”

She notes that Siemens lives and breathes its motto of “ingenuity for life” not just in technological terms, but in its governance practices as well. “Siemens has experience from around the world in the renewables space, and they’ve been able to bring us that perspective, and that has been very helpful to us,” says Picard-Thompson. “We very quickly had our operating team integrated with the Siemens team, and they spent a bit of time in Germany, working side by side with the German engineers and doing all work there for the review of the individual equipment pieces. I think that worked very, very well. I would say that to this day, the technical relationships are extremely strong. There are many good friendships that were developed through the process.”
AltaLink | Case Study

The strength of those relationships was put to the test during the project. First, regulatory and political reviews had to be completed before the green light was given – meaning the project had to be rolled out in a fairly short period of time. Then the challenges really began. Not long into the project, extremely wet conditions in central Alberta made for some very difficult ground conditions to overcome at the Sunnybrook site. At the same time, massive flooding also hit Calgary, where huge reconstruction efforts were needed, taking an already tight labour market from an economy that was booming at the time and making it infinitely worse.

Michael Blohs is the former Vice President, Transmission Solutions, Canada at Siemens. He and his local team were deeply involved in the project and in mastering the challenges.

“We had fierce weather conditions and adverse ground conditions and all kinds of problems,” he says. “But our Siemens team from Germany and Canada collaborated together with our colleagues at AltaLink to master everything and make sure AltaLink would succeed.”

Picard-Thompson echoes those thoughts. “Even though we had done the geotechnical work, there were still some surprises to be had in terms of the level of the water table, and some of the de-watering requirements for that site. Then a labour challenge hit Alberta at the time, when it was very difficult to find the people needed for construction. It was a very difficult challenge for Siemens, which won the bid from us on a fixed price. But Siemens was a trusted partner. They understood how important this project was to AltaLink. They didn’t walk away. They were accountable. They were so professional and committed to our success. They stepped up to the challenges and worked through all the issues together with us.”

The power of teamwork

Coming together to overcome challenges
What it all means: A new energy future for Albertans

The payoff to overcoming all those tough obstacles is a brand new transmission line that represents the future of energy in the province. WATL has the potential to reduce Alberta’s carbon footprint by 350,000 tons, which is the equivalent of taking about 65,000 cars off the province’s roads.

Says Picard-Thompson: “This is going to enable Albertans to maximize our use of renewables in the province. We’re very excited to have that capability in our system. It’s just fantastic for us to take renewables from the south to the central area and to all the industrial needs of the north, while also bringing any excess energy from cogeneration in the north to the south. It’s that true flexibility we have all been looking for in Alberta. And it’s being made possible by the reliability of the converter stations.”

At the same time, she adds, WATL is an investment that will “last for multiple generations, so it really is ingenuity for life,” as it underpins an affordable future of renewables. Thanks to WATL’s small footprint and with no need for additional power lines or towers or easements from landowners, future upgrades to triple capacity up to 3,000 megawatts can be done very economically with minimal infrastructure – something unimaginable not that many years ago.

Faisal Kazi, Senior Vice President of Energy Management at Siemens, explains that over the long term, the technology AltaLink obtained from Siemens is essential if renewables like wind are to power Alberta’s future.

“We as a company have already gone through this with our experience in Germany,” he says. “You don’t know when the sun will be shining and even when you do, a cloud can come in and suddenly your power goes down. And with wind, sometimes it’s blowing at night but you need the energy in the daytime. The solutions we bring help bring that stability up, and make it viable for the long-term future. And with what we have done in Alberta, we have shown how we can do it in a challenging climate and operational environment.”

Picard-Thompson says that never would have been possible without an excellent relationship between Siemens and AltaLink underpinning everything. And with much still to achieve to reimagine the electricity system in Alberta, she hopes there will be opportunities for Siemens to help AltaLink meet other challenges that remain.

“We think of Siemens as a partner, not just an equipment supplier. We have a good understanding of Siemens as a company and their professionalism, so we are comfortable to call them into the executive suite and say ‘we have this problem, can you help us?’ That’s a very different conversation than ‘here’s the RFP.’ We definitely look forward to working with them in the future on other large projects.”