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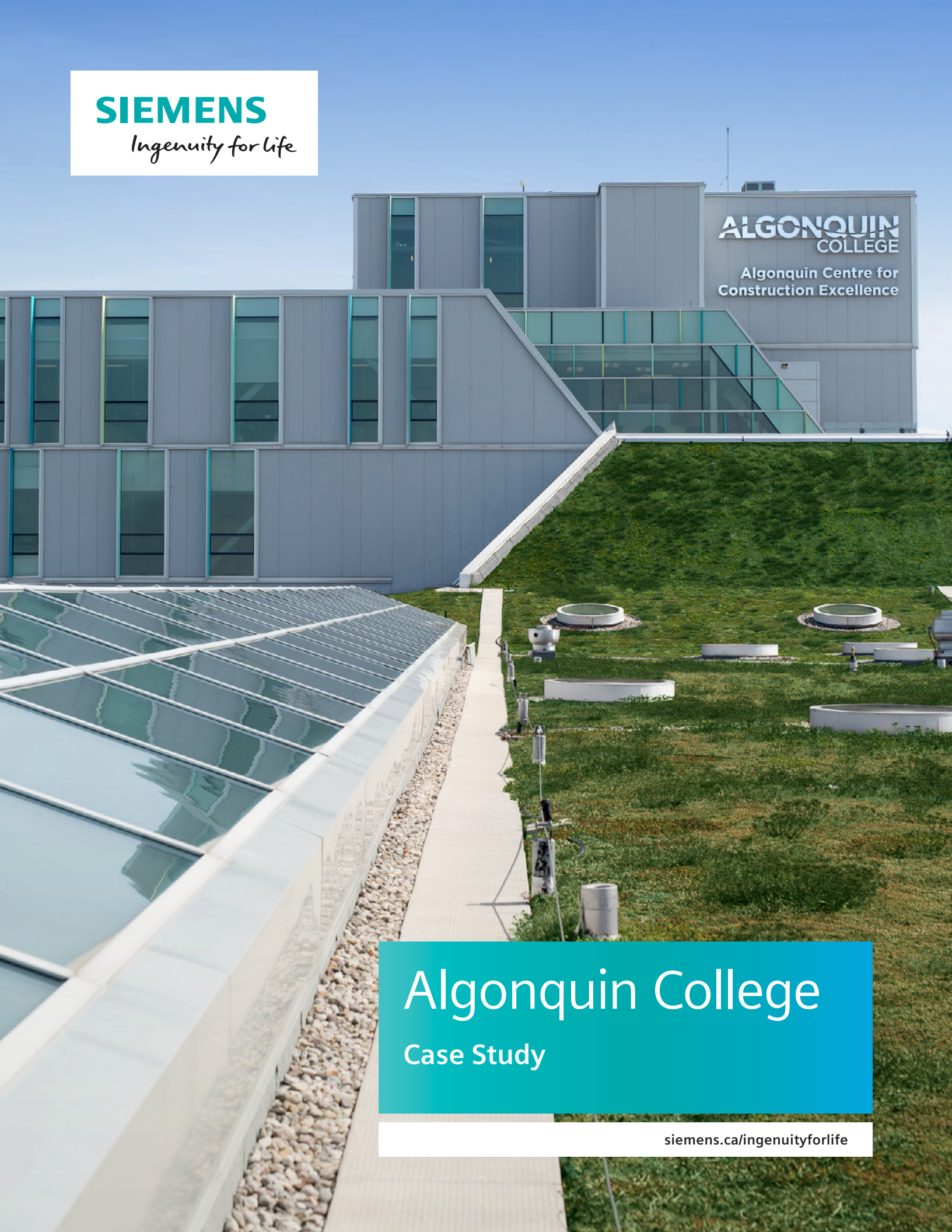
Ingenuity for life



Algonquin College

Case Study

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Siemens ingenuity enables Algonquin College's clean energy future

As the world faces unprecedented environmental challenges, there has never been a greater need for special leaders to emerge – to show what can and must be done for a sustainable future. For tomorrow's generation to serve as these passionate environmental stewards, today's educators must equip them with the knowledge and expertise they will need.

Algonquin College of Applied Arts and Technology is on a mission to play this important role, embracing bold and creative thinking as an influential and visionary post-secondary institution. Located in Ottawa, Perth and Pembroke, Algonquin is the largest college in Eastern Ontario, with 20,000 full-time and 43,000 part-time students.

In 2007, Algonquin became the first Canadian college to sign the Talloires Declaration, which commits post-secondary institutions around the world to being leaders in sustainability. Since then, the college has taken ever-greater steps to grow and strengthen its efforts on the environmental front – with students, professors, administrators, staff and members of the local community all involved. Among key milestones in recent years, the college opened four state-of-the-art, high-performance buildings between 2011 and 2014. Three have either achieved or are targeting Leadership in Energy and Environmental Design (LEED®) Gold certification. One has attained a LEED® Platinum certification.

Innovative technology and new ways of thinking from Siemens are making Algonquin College a sustainability role model – for students, faculty, the local community and society at large

Inspiring students to move society toward a greener future

The ultimate objective is to have Algonquin College create a clean energy future for itself, in which greenhouse gas emissions at the institution will be eliminated by 2042. Along the way, the college aims to educate students in new and exciting ways, so they can help take society at large in the same direction.

The college recognizes that an enormous amount of innovation is needed to realize its ambitious plan. That's why Algonquin's administration is teaming up with Siemens Canada as a unique technology partner for an energy services contract like no other.

Working closely together, the two sides are devising and deploying amazing new concepts, which are attracting interest from institutions around the world.

Ingenuity for life with Siemens and Algonquin College

- Algonquin is collaborating with Siemens on infrastructure upgrades for energy efficiency, resulting in $3.2 million in annual operating cost savings
- Algonquin is serving as a "living lab" of leading-edge sustainability technologies
  - a wide range of Siemens innovations include on-site cogeneration for energy independence – as well as solar panels, energy storage, and electric vehicle charging – all managed by a sophisticated microgrid
  - the Energy Innovation Centre provides students with hands-on access to the newest technologies
- Siemens and Algonquin are partnering to create a unique culture of sustainability at the institution
  - have introduced sustainability graduate certificate program
  - sustainability has been integrated into curriculum of all undergraduate disciplines
  - there is a dedicated Siemens resource person on site to promote sustainability
  - they work together for applied research on energy management

"I really believe the work Siemens and Algonquin have done together is absolutely ripe with ingenuity. We have put our brains together to come up with groundbreaking ideas to drive toward a net zero carbon footprint."

Cheryl Jensen,
President, Algonquin College

How it all began: Inviting bids on an Energy Services Contract (ESCO2)

Similar to the province's other 23 colleges, Algonquin is a not-for-profit Crown Corporation that adheres to the Colleges Act, which sets clear guidelines on how projects must be tendered and contractors selected. Everything must be done in a public, open and transparent manner.

For this energy services contract Siemens put forward a strikingly bold proposal that stood out from all the others to help the college realize its vision.

"We felt Siemens could not only be a technically service provider, but also a strategic partner that could deliver significant value in a much broader sense," says Siemens Stéphane Chayer, Vice President, Building Technologies. "We demonstrated in our RFP response that we had a deep understanding of both the challenges and opportunities for Algonquin College, and leveraging that greater knowledge would contribute to their strategic plan. We showed how tapping into a number of other business units at Siemens would result in new ideas and possibilities."

Siemens ingenuity powering the campus while inspiring students

Work on the ESCO2 program started with a wide range of building renovations to improve energy efficiency. That included everything from new water fixtures, HVAC retrofitting, improved metering and replacing the cooling tower to installing energy-saving light bulbs, intelligent lighting systems, modernized kitchen equipment, and other automated controls to ensure energy-optimized building performance.

Those improvements have resulted in significant reductions in greenhouse gas emissions from campus buildings, as well as some substantial financial benefits. Over the long term, these will add up to tens of millions of dollars in operating cost savings and reduced deferred maintenance costs.

"One of the main reasons we went down this path with Siemens was a real intent to reduce the expenses of energy at the college," explains Jensen. "We're a large institution that is costly to run. The fact that all of this has reduced our energy expenses $3.2 million annually is quite significant, but it's also innovative, because to be able to put all that money back into the classroom and our student facilities is really quite remarkable."

Todd Schonewille became Director of Physical Resources at Algonquin in early 2016. He joined the college after a long career working in facilities management, including many years at hospitals.

"I have been involved with some energy services contracts in my career, but this one at Algonquin is of a proportion and scope that is unprecedented," he explains, noting that the partnership with Siemens was one of the main reasons he came to work at the college. "Technically, it's a very profound offering, ranging from traditional lighting and water fixture upgrades that are typical of these types of contracts all the way up to combined heat and power cogeneration, which is a very significant technological advancement and very unusual. But then it goes beyond even that. It's a special relationship that ties directly into building a culture of sustainability and environmentally-friendly practices, which gets to the root of energy conservation."

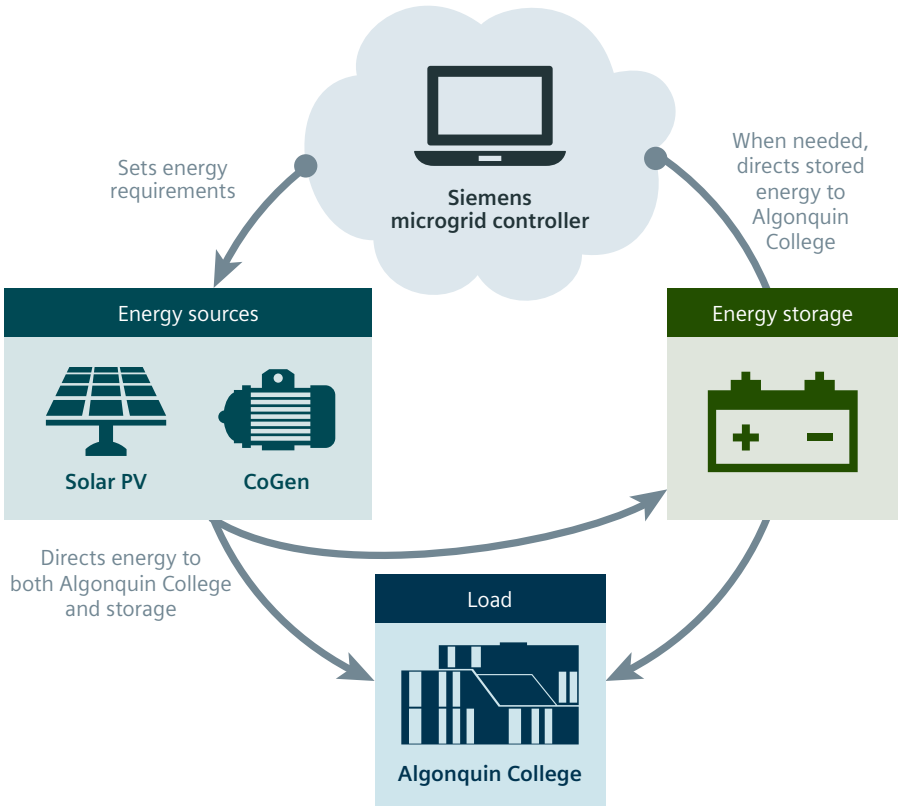
Electricity cogeneration and other innovations

One of the most ingenious technological aspects of Siemens work at Algonquin is a natural-gas-fired cogeneration plant. It can provide four megawatts of electricity, delivering enough heat and power to make the college almost completely energy self-sufficient.

"It's state-of-the-art technology that allows us to change our consumption of energy based on the markets and based on what the campus actually needs," describes Jensen. "We can be a 24-hours-a-day, seven-days-a-week running plant. If the hydro goes out, we can keep the lights on and the programs running. It's an example of an international best practice."

Schonewille notes that not only is Algonquin's cogeneration innovative in that it's practically unheard of for an educational institution to even have this capability, but the plant is particularly creative in how its technology is arranged.

"We're deploying a chiller with it, so it allows us to use wasted heat both in the summer as well as the winter," he says. "And we're in the process of extending our thermal network to allow us to retrofit existing buildings that were, for the most part, standalone units, so we're able to make use of that heat and power in all of our other buildings as well. It might be common for others to do these things on a piecemeal basis, but the way we're pulling it all together is truly unique."



Algonquin College can create, direct and store its own energy. Siemens microgrid controller sets energy requirements from two energy sources – solar and the cogenerator. These sources then direct energy to both the load (Algonquin College) and to the energy storage. And when needed, the Siemens microgrid controller can direct stored energy to Algonquin College.

As striking as the impact of building renovations has been, it's just the start of the story for what the Siemens-Algonquin strategic partnership is achieving. Of note:

- Siemens is deploying new, cutting-edge green technologies to make Algonquin a "living laboratory" showcase of what the future will look like in areas such as solar power and energy storage.
- Siemens is enabling Algonquin to generate its own power, to the point of true energy independence, where it's possible to maintain operations off the main grid.
- Siemens and Algonquin are conducting applied research together to develop and refine new energy management solutions.
- Siemens experts are teaching students about sustainability, through a new graduate certificate program that enables specialization in the subject, as well as more broadly so all students have the concept rolled into whichever program they may be studying.
- Siemens serves as a catalyst at Algonquin, including basing a sustainability coordinator there, to get everyone at the college embracing environmentally-conscious behaviour to the fullest extent possible, which is helping make sustainability a core value that's central to the school's culture.

A sophisticated microgrid at the heart of it all

Complementing the cogeneration are forays into other energy innovations, such as solar power, energy storage, and electric vehicle charging stations. And all of these are tied together with the cogeneration through a special microgrid solution from Siemens – which serves as the "brain" of the college's energy management system.

"The microgrid automates everything today plus gives flexibility for whatever new innovations may emerge down the road, so the college can take advantage of a future-proof approach," explains Andrew Melchers, former Business Manager of Digital Grid Products & Systems in the Energy Management Division at Siemens.

The microgrid, he adds, is key to Algonquin's energy self-sufficiency. The college can require as much as five megawatts of power at any one time. The cogeneration plant can produce about 80 per cent of that. For the remainder, Siemens ingenuity takes over. Intelligent software within the microgrid is married to building automation systems, so places where power is not needed can be identified. For example, a given building might be at a reduced capacity on a certain day of the week. When enough loads like that are cut, the campus can go on "islanded mode" and be totally separate from the main power grid. That means Algonquin can keep operating if there is a power outage in the main grid.

From a financial perspective, at any moment, the microgrid can make a cost-effectiveness decision. If it's cheaper to pull power from the grid, that path can be chosen. If islanded mode off the grid makes more sense, that mechanism can kick in.

Student learning is the priority

All the ingenuity of the microgrid, cogeneration and alternative forms of energy are not hidden from view, as is typical of traditional infrastructure. Instead, all the technology is fully leveraged in creative ways, with a pronounced focus on student education.

On Earth Day in 2016, Siemens and Algonquin signed a Memorandum of Understanding. Algonquin College and Siemens Canada will continue to collaborate on leading-edge academic programming that will maximize experiential learning opportunities for students and lead to new applied research opportunities. Siemens CEO Robert Hardt summed up the significance of the moment at that signing.

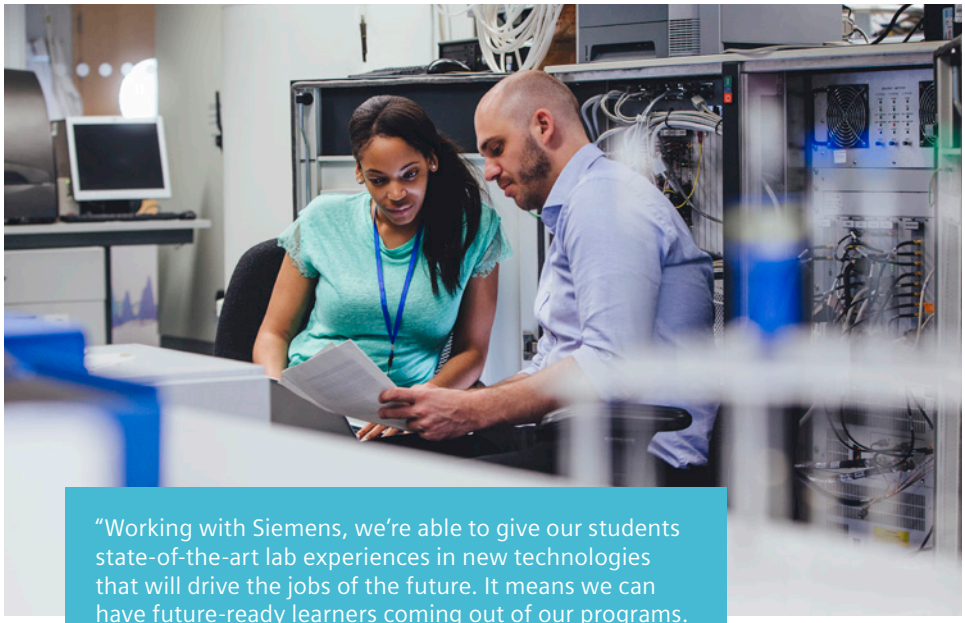
"Canada's energy landscape is changing dramatically and the industry innovation needs to happen in a real-world setting," he explained. "Today's students are tomorrow's skilled workforce and strong private-public partnerships like the one between Siemens and Algonquin are vital to enhancing education and research in the energy space, ensuring Canada remains competitive and sustainable."

The college has put all its leading technology on bold display at an "Energy Innovation Centre" – for everyone to see how integral it is to the institution's culture of sustainability. They can see the solar panels in action, learn how the energy storage and electrical vehicle charging work, and even study the actual remote monitoring screen of the microgrid in real time.

"It shows how we're a living lab that's constantly evolving," explains Schonewille. "It's all about giving students access and awareness of technologies they may not be able to experience otherwise."

As Jensen puts it: "At Algonquin, we're learner-driven. Working with Siemens, we're able to give our students state-of-the-art lab experiences in new technologies that will drive the jobs of the future. They're not just learning about it in the classroom. They can see the inner workings of something like our cogeneration plant, and understand what it does for the college. It means we can have future-ready learners coming out of our programs. Our students want to change the world, and that's what they'll be able to do."

In that spirit, Siemens and Algonquin have teamed up on a new energy management graduate certificate program. The curriculum comes straight out of the ESCO2 program, with students getting hands-on with all the equipment, to maximize their learning as they literally keep the lights on at the college.



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Most recently, Siemens and Algonquin have come together so students in robotics, mechanical engineering and electrical engineering can learn all about mechatronics -- an area of Siemens expertise that focuses on a holistic, systematic approach to the various elements involved in automation. In addition, a dual education program has been launched in which candidate students spend four months between semesters working at the Oakville headquarters of Siemens Canada.

Chayer says one of the most gratifying aspects of the overall Siemens-Algonquin partnership from his perspective is the chance to play such an active role in student education. He cites an inspiring example to illustrate the point.

"In all third-year programs at the college, students are asked to take on an applied research project. As Siemens, we put forth a challenge involving energy and wireless technology and a group of four students took it on. They came up with a very impressive solution. That's just one small example of how we're able to be very close to the students and it's great for everyone involved."

Jensen adds that having a Siemens person on-site full-time at the college as a sustainability coordinator dedicated solely to student learning is particularly helpful.

"That's someone who works with students and faculty every day to put their ideas into practice. We wouldn't be able to do that on our own."

A model for the local community and beyond

It's a source of great pride for everyone at Algonquin at how the Siemens partnership on sustainability enables the college to make such a rich contribution to society. Noting how the college is an integral part of the Ottawa community, Jensen foresees graduates taking the lead on sustainability throughout the city.

"We're in Ottawa, the capital of the country, so to be a model for sustainability here is incredibly important," she says. "And the City of Ottawa is focused on being a sustainable community, so we are aligned with our community, and positioning our students to find employment in the city."

The work being done by Siemens and Algonquin is also squarely in line with the Ontario Climate Change Action Plan, notes Schonewille.

"Our next step is to reduce our greenhouse gas use even further," he says. "Ultimately, I envision us running off some alternative fuel sources, and Siemens already has some thoughts on how we can do that, which is very exciting. It's yet another way we can look at cutting-edge green technologies and practices with Siemens."

In short, through its partnership with Algonquin, Siemens is delivering ingenuity that will have a positive impact on countless lives – now and for generations to come.

"Energy and the environment are in the top three on every public and private agenda, and those priorities are growing in importance every day," says Chayer. "We need talented and skilled graduates to continue to help Algonquin College and others facing similar challenges. Siemens and Algonquin are showcasing energy conservation and new power generation – and not only in technical and technological terms, but also behaviourally and with cultural change. We are pushing boundaries and achieving a real campus transformation."

A unique spirit of partnership

Jensen says Algonquin being an influential thought leader on sustainability has "only become possible because of the partnership we have with Siemens."

"Partnerships are all about people," she says. "You can have all agreements in place that you want, but it's really about building trust and relationships with people. If you want to look for the type of partner that really gets it – that sees the synergy of educators and companies working together – then you need to look at Siemens. They understand totally that talent management and bringing technology and expertise into educational institutions is important, not just for their future prosperity and sustainability, but for our young people and for the communities that we serve."

As Chayer sums it up: "When we started this program, we had a bold vision of achieving a real campus transformation. And we had a client in Algonquin that inspires innovation and was willing to support and get involved in new ideas and leading technology. You've got to have a little faith and you've got to work together. You need a different kind of relationship. By working in a true spirit of partnership, we now have a unique showcase campus worthy of global recognition. I don't know of any partnership like this anywhere."

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Siemens Canada Limited
1577 North Service Road East
Oakville, ON
Canada L6H 0H6

corporate.communications.ca@siemens.com