

Where great minds collaborate
to power a better tomorrow





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A bright new energy future

The Alectra Green Energy and Technology Centre (GRE&T Centre) is a dedicated innovation hub where we can collaborate to discover the possibilities. With a focus on **digitalization** and enabling **innovation**, we connect with our **customers** through innovative pilots, explore non-traditional options to modernize the energy **grid**, create new services and the increased **optionality** that energy consumers expect, and enable **clean** transportation in our communities, to support and build the energy grid of the **future**.

OUR FOCUS AREAS



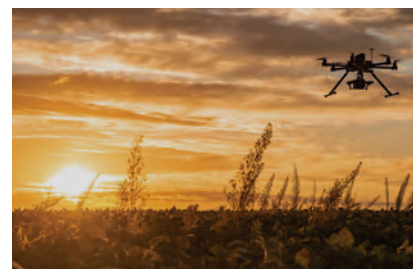
Smart Cities

We look for the best ways to power homes, buildings, and transportation with smart, clean technologies. Electrification of transportation is an important part of this journey. It requires utility transformation and delivers new customer journeys. Through pilot projects and incentive programs we are enabling EV charging in our homes, businesses and communities and we are helping to transition fleets and transportation to electric.



Grid Innovation

We leverage grid modernization technologies to enable empowering energy options for customers and a more sustainable grid. We are integrating Distributed Energy Resources (DERs) such as solar panels, battery storage, and electric vehicles. We are building transactive energy platforms where customers can participate in 2-way energy transactions, exchanging their energy for rewards. With learnings from pilots, we are demonstrating ways for utilities to transition to a more versatile and innovative grid as a Distribution System Operator (DSO).



Advanced Planning

To meet the evolving demands of customers and to deliver efficient services, utilities need to understand and leverage the disruptive technologies available today to drive actionable results. We navigate the latest market intelligence, study emerging megatrends, explore changing customer expectations, and test the latest digitalization tools to build the capabilities necessary to deliver new energy solutions of the future.



We are at the cusp of transitioning to an integrated new energy grid which will be more digital, more empowered, and more decentralized. The GRE&T Centre has a very strong track record of delivering unique, made-in-Ontario solutions which, with the right investment environment, can become ubiquitous and will provide customers with the optionality they expect and will require in the energy sector of tomorrow.”

Brian Bentz, President and CEO, Alectra Inc.

Q&A with leadership

Highlights of 2022

The GRE&T Centre, as the innovation hub at Alectra, is not afraid to take risks and look to where new opportunities for sustainable energy solutions might be found.



Dr. Giuseppina (Pina) D'Agostino
Alectra Board Member and Chair of the
Alectra GRE&T Centre Advisory Committee



Julia Zhu
Executive Vice-President and Chief Digital &
Innovation Officer



Neetika Sathe
Vice-President, GRE&T Centre

Q:

Why do you believe it is important for an electric utility to have a green energy and technology centre (like the GRE&T Centre) that focuses on innovation and new technology?

Julia

Having the GRE&T Centre focus on innovation, green energy, and new technology is a powerful way to enable and make visible the Alectra vision and mission. As we explore ways to support net zero goals and address energy resource adequacy challenges, the GRE&T Centre, as a dedicated innovation hub, helps us to look at how we can solve problems differently.

The energy industry, which has been very asset driven, is going to become much more customer-centric. We are finding new ways to empower customers. We are orchestrating new energy options and we are making these new options more visible to customers so that they can make energy choices that contribute to our energy future. Technology will be a strong competitive advantage in this process. And the GRE&T Centre is at the core of the process of enabling technology and innovation for new ways of doing things.

Q:

What benefit do you think the GRE&T Centre brings to Alectra customers and the energy industry?

Pina

The GRE&T Centre, as the innovation hub at Alectra, is not afraid to take risks and look to where new opportunities for sustainable energy solutions might be found. It is backed by talent, technology, and new ways to understand and harness data to help our customers. All of these elements which have come together at the GRE&T Centre are critical for Alectra's journey forward. The energy sector needs Alectra to power a better tomorrow.

Q:
The GRE&T Centre is not only described as an innovation hub, but also as a collaboration hub. Can you comment on what you think has been the most significant collaboration in the GRE&T Centre's journey?

Neetika

The GRE&T Centre has become a true hub for collaboration as we work to accelerate pilot projects and studies. I would say that the most impactful collaboration has been with the customers participating in our pilots. We had residential customers and small businesses participating in our GridExchange pilot exchanging energy for rewards. We have municipalities and businesses participating in our AlectraDrive @Work pilot, offering EV charging for their customers, employees, and the general public. We have EV drivers participating in AlectraDrive @Home, teaching us about EV driver behaviours, charging habits, and the impact of incentives. And in our IESO York Region Non-Wires Alternatives (NWA) Demonstration we worked with large commercial customers who were bidding into our auction for energy capacity and flexible resources. The learnings we get from engaging directly with customers through our pilots is priceless. It is the best kind of collaboration because it starts with an idea that goes directly to the customer.

Many of our pilots would not even be possible without the collaboration and participation of our industry partners like our Regulator, the Ministry, and the IESO.

Q:
Reflecting on 2022, what would you say have been the GRE&T Centre's greatest achievements?

Pina

There is much to be proud of. The GRE&T Centre is at the forefront and has been exceeding expectations as a catalyst for change. There has been an acceleration of change in the industry that has been very exciting, and the pace of this change has been further accelerated over the past few years because of the pandemic. In 2022, the GRE&T Centre launched and completed innovative pilots, brought forward new ideas, and recruited new talent like Julia, our new EVP and Chief Digital & Innovation Officer. All of this has put us in a great position for meaningful change in the industry for energy transformation. It is also particularly important as we respond to the climate crisis.

Neetika

We also have various project achievements worth mentioning.

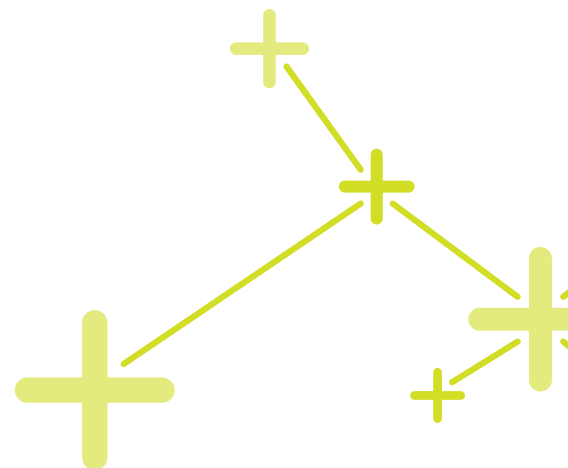
One of the greatest highlights of 2022 was seeing the impacts of our Advantage Power Pricing (APP) pilot which tested various electricity pricing options. It provided the inspiration for the new Ultra-Low Overnight Price Plan which was announced in early 2022. The new pricing option will be available for all electricity customers across Ontario in 2023 and will benefit EV drivers who typically charge their EVs at home overnight.

Another highlight was completing our second successful year of the IESO York Region NWA Demonstration. This pilot, delivered in partnership with the IESO, was the first of its kind in Canada. It aimed to design and demonstrate a distribution-level DER market that is interoperable with the IESO wholesale market to offset system demand, and to defer, reduce or avoid the need for traditional infrastructure investment. This pilot continues to support advocacy efforts and demonstrates Alectra's leadership in finding new ways to meet system needs.

We are also pleased that the GridExchange pilot, which was completed in early 2022 and which provided many learnings, is ready for larger scale implementation.

Julia

When I joined Alectra in mid-2022, I was amazed at all the accomplishments of the GRE&T Centre team. There are a lot of projects that are commercial ready and there are a lot of learnings being shared. The team is really an orchestrator to support internal and external customers with innovation which is really important for meaningful transformation. The team is looking at facilitating opportunities that are five years down the road and others that are here today. The GRE&T Centre is building, educating, and transforming again and again. The GRE&T Centre has been able to build impact.



Q&A with leadership



We are seeing decarbonization, electrification (fuel switching), digitalization, and the decentralization of the grid. These are areas where we know there is going to be more change that will impact the profile of the electric distribution and competitive business. All these changes provide opportunity for growth. I am pleased to see the GRE&T Centre contribute to the overall growth objectives of Alectra in a very significant and positive way. I am pleased with their contribution during 2022.”

Norm Loberg, Chair, Alectra Inc. Board of Directors

Q:
What do you think is the next big trend in customer expectations?

Julia

The energy sector needs new ways to engage customers to solve problems together. The customer expectation is that organizations won't talk about new customer-friendly options but will simply make them happen. We need to use education and communication to really understand customers, to find out what customer-friendly really means to them, and ensure we know what they want. Once you hear from customers and you have learned, they expect you to move fast. Customers expect us to listen, take action right away, and execute. It is important for us as a utility to test and learn. We have to focus on safety, cost, reliability, and sustainability. And we must continue supporting these focus areas while making change happen at the pace customers are expecting.

Q:
What work is the Alectra GRE&T Centre doing in e-mobility that you think the world should be paying attention to?

Neetika

In the true spirit of being the customer's energy ally, we put a lot of effort into ensuring any hurdles or barriers that may be keeping people from transitioning to EVs are taken care of. Whether it is facilitating personal electric vehicles, fleets, or public transportation, we are trying to make the process as easy as possible. The announcement of the Ontario-wide Ultra-Low Overnight Price Plan to benefit EV drivers is just one example of how a utility can help its customers. It is proof that we can support the transition to a cleaner e-mobility landscape. We are also putting in our own EV infrastructure, enhancing the charging infrastructure across our Alectra service territory.

Alectra GRE&T Centre Advisory Committee

The Committee provides advice on the GRE&T Centre's strategic direction as well as its pilots, partnerships, and other engagement activities.

It is composed of experienced professionals from diverse fields who bring a fresh, outside-in perspective. They possess the technical knowledge, business acumen, and leadership skills required to contribute local and global insights for navigating innovation in the evolving energy ecosystem.



Alectra GRE&T Centre Advisory Committee L-R :

Dr. Brian Mergelas, Lorelei Graham, Dr. Janusz Kosinski,
Dr. Giuseppina (Pina) D'Agostino, Nicholas Parker,
Chantel Broten

Q:
In 2019, Alectra not only launched the GRE&T Centre, but it also formed a GRE&T Centre Advisory Committee. What impact has this Committee had on the GRE&T Centre?

Pina

It has been an incredibly positive experience. The Committee has really elevated the conversation from a strategy perspective. The Committee provides perspectives from various disciplines which are all aligned with our central vision to make things better through innovative solutions for customers.

I am refreshed by the level of discussion, the engagement, and the foresight around the table. It has infused Board deliberations in a positive and uplifting way. I am grateful to see both the Board and the Advisory Committee so well connected to a common goal. The Committee is a source of inspiration at the company and the GRE&T Centre. It has a valuable role within the GRE&T Centre and Alectra.

I would also like to highlight the immense value of the diversity at the Advisory Committee and the GRE&T Centre. It is not only diverse perspectives, education, and experience, but also a good balance of gender diversity on our teams with a particularly strong representation of women in GRE&T Centre leadership.

Q:
What are you most looking forward to in 2023?

Neetika

There are new energy opportunities here and now. There is an immense opportunity for the GRE&T Centre to support the call to action across the utility for transformation and to land the vision of the utility of the future. Making that vision actionable will be the purpose of the Centre for the coming years.

Pina

I am looking forward to more engagement with diverse stakeholders and innovators within our energy ecosystem to leverage the talent that is out there and join it with our own to figure out smarter and more sustainable ways to get new energy solutions. There is so much possibility ahead. We are just getting started.

I would also like to reinforce the ongoing importance of people. It is so important to execute with people, including internal employees, external customers, partners, and so on. Going forward, we will all be in a space with more automation and with AI. Technology will be galloping forward at a quick pace. We mustn't lose sight of our humanity and people.

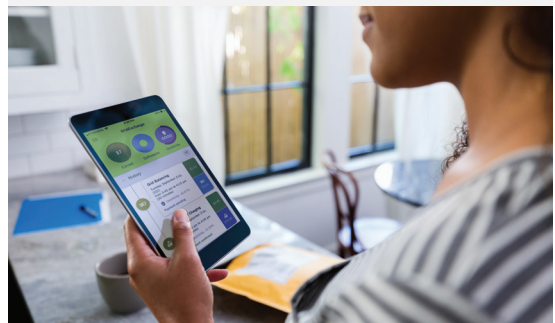
2022 MILESTONES AND HIGHLIGHTS



In February 2022, Ontario announced the new Ultra-Low Overnight Price Plan which was inspired by our APP pilot. This price plan will attract and reward EV users by offering cost savings to charge EVs overnight at off-peak times. By shifting EV charging load to off-peak times it will also help us better manage the grid and potentially reduce system costs for the benefit of all customers.



Year two of the IESO York Region NWA Demonstration was successfully completed in 2022, demonstrating the possibilities for utilities to harness local electricity markets to help meet system needs.



The GridExchange pilot empowered customers, reduced their energy costs, and encouraged the adoption of clean energy resources. We look forward to applying the learnings from this pilot which concluded in 2022.

Innovation projects that explore the grid of the future



The GRE&T Centre delivers innovative projects to support the energy grid of today and prepare for a better tomorrow.

Through pilots, studies, and small-scale deployments, we are harnessing digitalization, testing technologies, and building new energy markets because we know that when we enable innovation we can:

- Find new ways to support and enhance the reliability and resiliency of our energy grid
- Support customers with more optionality and new grid edge solutions and services
- Deploy flexibility and automation across the grid to help reduce peak demand and to leverage more renewable energy resources

¹ This project was developed by the IESO and Alectra Utilities Corporation and supported by funding from the IESO Grid Innovation Fund and the Natural Resources Canada Smart Grid Program. Alectra is the delivery partner for this demonstration with contributions from EPRI and Util-Assist.

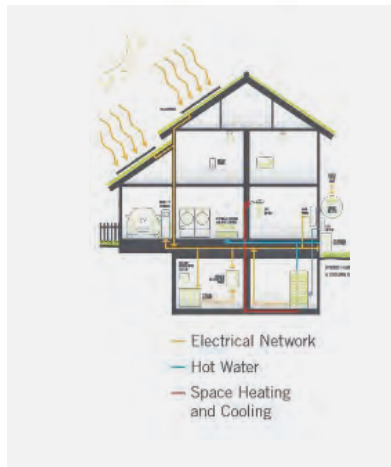
² The POWER.HOUSE™ pilot was launched with project partner Sunverge Energy and funded by the IESO's Conservation Fund. The Power.House Hybrid pilot is funded by Natural Resources Canada's Green Infrastructure Fund. Partners include Enbridge Gas Inc., City of Markham, and Toronto Metropolitan University.

³ The pilot was partially funded by Natural Resources Canada's Green Infrastructure Fund and includes Sunverge Energy Inc., Flo, and Savage Data Systems as partners.

Project highlights

NWA demonstration procured
15MW capacity including
6.8MW local reserve
 for the 2022 commitment period

Since 2015, POWER.HOUSE
 has reduced GHG emissions by
24,800kgCO₂e



4,881kWh
 delivered/reduced
 during GridExchange pilot events

58 homes
 By end of 2022, the fleet of
 POWER.HOUSE homes had
 generated a total of **695MWh** of
 energy = enough to supply energy
 to **58 homes** for one year



IESO York Region Non-Wires Alternatives (NWA) Demonstration¹

This two-year pilot, which completed operation in late 2022, has been demonstrating how a local electricity market, that is interoperable with wholesale markets, can use Distributed Energy Resources (DERs) as non-wires alternatives to support the energy grid. It procured customer-owned DERs (including energy assets at residential, commercial, and industrial facilities like thermal resources, battery storage, demand response, etc). It enabled those DERs to compete and provide services to meet local and system needs. When energy needs were high, their capacity or local reserve helped the utility manage peak demand and helped meet local energy needs. It also demonstrated the potential for widespread DER deployment as a feasible non-wires solution to defer, reduce, or avoid costs associated with infrastructure investments.

This distribution-level electricity market was the first of its kind in North America and the pilot results will help inform the sector about harnessing DERs for a more innovative and resilient energy grid.

POWER.HOUSE™ and Power.House Hybrid²

The POWER.HOUSE pilot explores ways to support single-family homes with the transition to net zero energy emissions. Since 2015, it has provided residential customers with integrated solar-plus-storage units that protect against power outages, reduce electricity bills, and lower carbon footprints.

The Power.House Hybrid pilot further enabled the move to net zero by integrating a hybrid set of electrical and thermal equipment into a virtual power plant platform. This adjusts heat and electricity consumption within a home to minimize its carbon footprint. The homes include solar panels, battery storage, smart EV chargers with bidirectional meters, and a hybrid heating system with air source heat pump, smart air handler, and a tankless boiler.

These pilots, scheduled to conclude in 2023, have been a successful demonstration of whole home integration, providing great learnings and showcasing net zero efforts in our communities.

GridExchange Pilot²

GridExchange is a cloud-based transactive energy platform that offers utility customers the ability to participate in an energy marketplace. Residential customers with energy assets like solar panels, battery storage, or EVs can receive compensation and rewards for managing their energy use, such as deferring the charge of their EV to off-peak hours or sharing energy from their solar panel. They review and confirm participation in these offers in real time on a mobile and web app, with a transaction as seamless and as familiar as online shopping.



We are always chatting about GridExchange. It's like a game. How much did you save? And then we share screenshots."

—GridExchange customer

Electrification of transportation



“ A key focus at the utility is on grid modernization and grid automation. The energy ecosystem includes two-way power flow with customer-owned DERs and the proliferation of EVs. Our objective is getting the system ready to respond to that. It’s a long term emphasis on managing and monitoring not only the grid, but also evolving customer needs, the evolving energy market, and especially electrification.”

Mike Matthews, EVP, Asset Strategy & Operations, Alectra Utilities Corp

A cleaner way to power our communities

Accelerating the electrification of transportation is an important step towards a cleaner energy future.

The insights and experience we gain from working directly with our energy customers on pilot projects, feasibility studies, and proof-of-concept demonstrations are

- Informing utility strategy (including advocacy, regulations, utility transformation, and preparing for mass EV adoption)
- Providing tools for electrifying fleets, transit, and personal vehicles
- Supporting the customer journey of electrification
- Influencing the development of a vibrant EV ecosystem in our communities



AlectraDrive @Work¹

AlectraDrive @Work piloted a solution that offers EV charging to employees and visitors at workplaces. It aimed to help the businesses and building owners offer the convenience of EV charging at their buildings while also managing the flow (and minimize the costs) of electricity needed to serve their buildings and the charging stations. We gained insight into managed EV charging technology solutions, EV driver charging behaviour, new business models, and integration possibilities.

AlectraDrive @Home²

This pilot is exploring how electric utilities can encourage EV adoption by supporting people with charging solutions in their homes in a way that benefits drivers, the grid, and the environment.

- Testing out new business models that offer convenient charging at home
- Insight into charging behaviour and impact of incentives to charge at off-peak times
- Improved utility management of growing electric load from EVs
- Reduced reliance on fossil fuel for transportation

Electric vehicle supply equipment (EVSE) has been installed in multi-unit residential buildings (like condominiums) and in single family homes. They will be collecting data throughout the pilot to help inform Alectra's strategy for supporting customers with electric vehicles.

AlectraDrive @Work

2022 PILOT RESULTS

34

EV charging stations,
level 2 charging, 3 workplaces

42.5MWh

generated by the Alectra solar
carport between 2019-2022

15,000+

charging sessions across
3 sites delivering more than
165,000kWh

AlectraDrive @Home

2022 PILOT RESULTS

230+ EV drivers

40%

reduction in charging during
peak periods using an
incentive-based model

¹ The AlectraDrive @Work pilot (2018–2022) was made possible through the financial support of the Independent Electricity System Operator's Grid Innovation Fund and by Natural Resources Canada's Charge the North Project led by GEOTAB/Fleetcarma. Partners included Flo, ChargePoint, Generac Grid Services, Schneider Electric, GEOTAB, Plug'N Drive, Robertson Bright Inc., Util-Assist, Guidehouse, and Eguana Technologies.

² The AlectraDrive @Home pilot (2019–2023) is made possible through the financial support of the Independent Electricity System Operator's Grid Innovation Fund and by Natural Resources Canada's EV Infrastructure Demonstration Program. Partners include Generac Grid Services, Geotab, Flo, Plug'N Drive, Guidehouse, BracerEV, Robertson Bright Inc., and Smith & Long.

Collaborating with our customers and communities



“Allowing customers more choice requires us to be an enabler of new technologies. We need to keep the grid up to date, we have to give customers new tools to give them visibility into their energy portfolio, and we need to do this in a prudent manner to maintain the system of today and to make sure we can support where the system is going.”

James Douglas, EVP, Customer Experience

Working together to build our energy future

The best and most important collaboration is with customers.

- Recruiting residential customers to participate in pilots
- Working with Municipalities to feature sustainability and net zero efforts in our communities
- Testing new service offerings for commercial and industrial customers
- Supporting our colleagues with the development of innovative tools
- And much more



“POWER.HOUSE gave us a tremendous peace of mind during the ~12 hour power outage that occurred as a result of the storm [that swept across Ontario on Victoria Day]. Our food supplies, sump pump, and other critical components were secured and fully operational, all thanks to the POWER.HOUSE program.”

“It’s crazy how much our bills have gone down. There are late spring and early fall days when I’m generating as much as I’m using.”

“The Hybrid system manages our heat, costs and sustainability goals all together and effortlessly.”

PILOT PARTICIPATION

300+ customers

within 6 GRE&T Centre pilots in 2022

230+ drivers

are providing insights on EV charging behaviour in **AlectraDrive @Home**

21

residential customers and 4 local businesses in the **GridExchange** pilot

17,000+

customers in the 2019 **Advantage Power Pricing Pilot** tested various price plans, including

400 EV drivers

who tested the overnight pricing model which inspired the new **Ultra-Low Overnight Price Plan**

10 large commercial and industrial participants participated in the **NWA Demonstration**

2022 **Local Capacity Auction** for the **NWA demonstration** was **2X oversubscribed**

50

L2 public charging stations were completed in 18 locations across 3 municipalities.

Collaborating with industry partners and leaders at **NRCan, IESO, and OEB**

Presented **GRE&T Centre innovation projects** at **20+ events**, to local and international audiences, at events that range from tens to thousands of participants

Gaining insights—Electrifying the transit fleet of a medium-sized city can save almost **\$1M a year in diesel fuel** and **5.5M kgCO₂e** of GHG emissions

\$1.5M

In 2022 we approved **\$1.5M** in Federal EV charging incentives to customers for businesses and fleets through **NRCan’s** third party delivery **Zero Emission Vehicle Infrastructure Program (ZEVIP)** program

Harnessing digitalization and innovation



The forefront of energy transformation

Embracing emerging technologies to enable a digitalized utility of the future is a strategic area of focus for Alectra. By innovating with our colleagues, industry partners, and the latest technology solution providers, we can optimize how we run the business and build new opportunities for our energy future.

We apply innovation, the power of data, emerging technology, AI, advanced analytics, and cross-industry learnings to support the energy grid, deliver innovative pilots, and build customer-friendly solutions.

The innovation projects undertaken by the GRE&T Centre identify emerging clean energy trends and in-demand technologies enabled by digitalization to help Alectra stay at the forefront of energy transformation.

Decarbonization through Electrification

As our customers and communities continue to focus on emission reductions and decarbonization, we continue to anticipate and prepare for more electrification in transportation (with EVs) and in our homes (with alternative heating options). This electrification means utilities need to prepare for new loads on the grid and they have an opportunity to play a significant role in helping to build greener communities. We have a strong purpose, driven by our customers, to support this energy transition.

- Incorporating renewable energy assets at the grid edge
- Leveraging the clean bulk generation of Ontario's power system
- Enabling EV charging, energy storage, generation behind the meter
- Providing opportunity for more two-way power flow
- Testing new optionality, pricing models, and services through pilots
- Incorporating more automation to build resilience and reliability
- Researching to better understand the impacts of increased load from electrification



Artificial Intelligence (AI) and Data

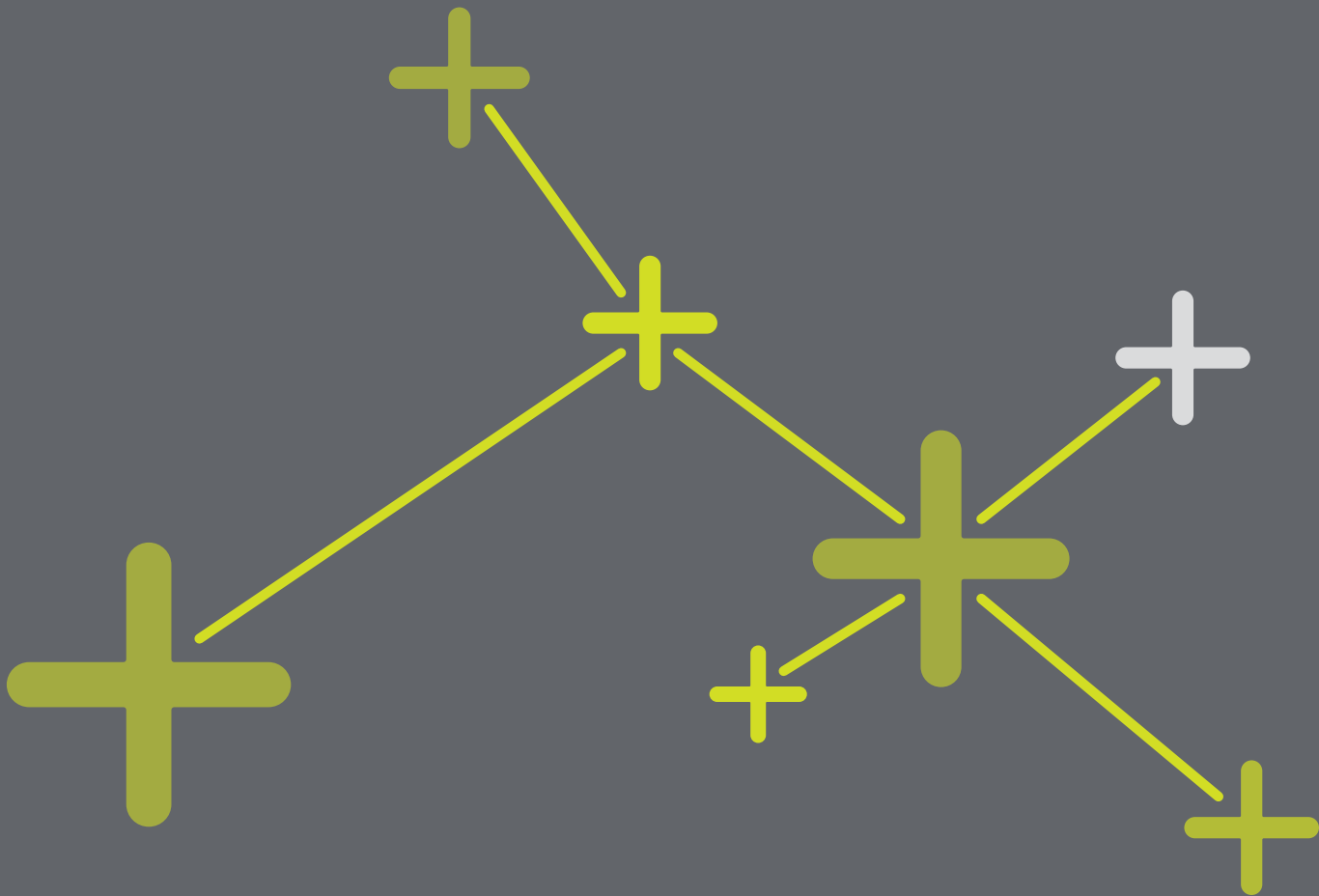
We are exploring opportunities to use AI with data analytics to improve the quality and efficiency of grid maintenance. These tools can strengthen the grid by increasing reliability, improving risk management, and reducing emissions from maintenance vehicles.

- More AI-based inspection tools leveraging LiDAR, Thermal imaging, automated drone scanning, to improve efficiency of grid maintenance
- Leveraging satellite imagery, LiDAR, and high-resolution cameras to help manage and plan tree trimming around power lines and to verify effectiveness of completed trimming
- Using data analytics through Advanced Metering Infrastructure (AMI) for EV detection, load shifting to off-peak times, and optimizing behind the meter assets
- Enabling new ways of doing things, finding productivity improvements and cost savings, through data-driven decisions

Alectra's vision is to be your trusted energy partner empowering a sustainable and brighter future

Alectra's mission is to provide innovative and reliable energy solutions which deliver lasting value for all

Alectra's GRE&T Centre is where great minds collaborate to power a better tomorrow



Alectra GRE&T Centre
395 Southgate Drive
Guelph, ON N1G 4Y1

