

# Environment

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For further information and to view the full report, you can access ENMAX's 2021 Environmental, Social and Governance report at [enmax.com/esg](https://enmax.com/esg)

# GHG emissions



## 2021 HIGHLIGHTS

- Completed a turbine upgrade and maintenance event at Shepard Energy Centre that added 11 new megawatts (MW) of generation.
- Met our target to offset 100% of our building GHG emissions (scope 1 and scope 2) for 2021.

## WHY IT MATTERS TO ENMAX

As a future-oriented essential electricity service provider, we are committed to advancing a cleaner energy future for the benefit of our customers, the communities we operate in and our Shareholder, The City of Calgary. For many years, the reduction of greenhouse gas (GHG) emissions has been a key component of our environmental protection and stewardship practices.

## Evolving our generation portfolio

We have already achieved significant emissions reductions over the past decade due to the transition of our power generation portfolio. When compared to our 2015 baseline, we have reduced the GHG emissions by 66 per cent. Today, we hold no coal-fired generation in our portfolio, and our power generation facilities are a combination of modern natural gas-fuelled power generation facilities and wind facilities.

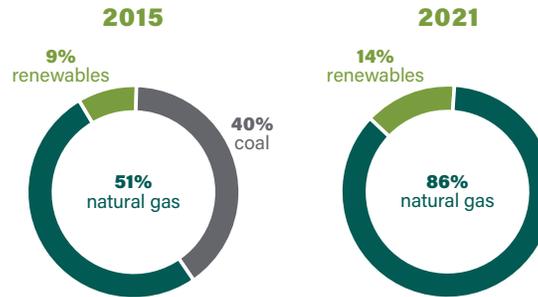
## OUR PERFORMANCE

### GHG EMISSIONS (SCOPE 1 AND SCOPE 2) CONTRIBUTIONS BY EACH BUSINESS

|                                     | 2021 |
|-------------------------------------|------|
| Power generation                    | 99%  |
| Operational and corporate buildings | 0.9% |
| Mobile fleet                        | 0.1% |

## OUR APPROACH

ENMAX has committed to achieving net-zero scope 1 and scope 2 GHG emissions by 2050. As a milestone towards achieving our net-zero vision, we plan to reduce or offset 70 per cent of our scope 1 and scope 2 GHG emissions by 2030 from a 2015 baseline. To reach these targets, we are identifying efficiencies at our natural gas power generation facilities, offsetting and managing emissions from our corporate and operational buildings, and advancing the electrification of our mobile fleet.



## GHG emissions across our business

Today, the vast majority of our GHG emissions come from our natural gas power generation facilities. Our primary source of GHG emissions is natural gas combustion at these plants, followed by a smaller proportion originating from natural gas and electricity consumption at our corporate and operational buildings, together with fuel combustion within our mobile fleet (see table at right).



Our largest power generation facility, Shepard Energy Centre, is the most efficient natural gas-fuelled combined-cycle generation facility operating in Canada today, as measured by tonnes of CO<sub>2</sub> per megawatt hour (MWh).

## PROGRESS IN 2021

We are taking the following steps toward achieving our GHG emissions reduction target:

### Efficiency improvements at our natural gas power generation facilities

While natural gas is one of the lowest carbon emitting fossil fuel options available for power generation, we are proactively working to find efficiencies and incremental improvements that further reduce our GHG emissions intensity.

#### HYBRID ELECTRIC GAS TURBINE COMMISSIONED

In May 2021, we commissioned Canada's first hybrid electric gas turbine at our Crossfield Energy Centre. By combining a new battery energy storage system with our existing natural gas-fuelled turbine, the hybrid asset allows us to provide standby power (spinning reserve) without producing emissions from natural gas generation. When a grid operator requests the standby power, the battery provides the initial supply while the turbine ramps up to meet the longer duration demand. Since the unit went into use, it has avoided the generation of more than 31,000 tonnes carbon dioxide equivalent (CO<sub>2</sub>e) that would have been emitted if those power dispatches had been provided by the non-hybridized natural gas turbine. ENMAX is leading the way in adopting and implementing this technology for the first time in Canada.



In 2021, our Generation Fleet Efficiency Program was recognized in Electricity Canada's (formerly known as the Canadian Electricity Association) Centre of Excellence.

#### TURBINE UPGRADES

As part of our ongoing efforts to improve operational efficiencies, we completed a turbine upgrade and maintenance event in 2021 at Shepard Energy Centre that added 11 new megawatts (MW) of generation capacity while recovering an additional 6 MW. This further increased the efficiency at Shepard—already one of Canada's most efficient combined-cycle facilities. A similar upgrade and maintenance event is planned for our Calgary Energy Centre in 2022.

#### STEAM TEMPERATURE EFFICIENCY

At our Calgary Energy Centre, we completed a project to increase steam cycle temperatures. This collaboration between a number of vendors and our multidisciplinary team optimized this operational process. The project resulted in additional facility output and an overall efficiency improvement. Efficiency improvements translate directly into less natural gas burn required and reduced GHG emissions.



## Offsetting and managing emissions from our buildings

ENMAX currently owns or leases six office and operational buildings in Alberta and 157 substations across Alberta and Maine. As part of our commitment to reducing our emissions from buildings, we continue to invest in:

### OFFSETTING OUR BUILDING EMISSIONS

ENMAX has been purchasing ECOLOGO® certified renewable energy certificates for the past 10 years to offset 100 per cent of ENMAX Place (head office) scope 2 GHG emissions. In 2020, we set a target to offset 100 per cent of our building GHG emissions (scope 1 and scope 2) from 2021 onwards. In alignment with our target ENMAX purchased ECOLOGO® certified renewable energy certificates and voluntary carbon offsets for our 2020 building emissions inventory to support this commitment. Offset purchases for 2021 will be finalized in Q3 2022.

### SUBSTATIONS MONITORING

Sulfur hexafluoride (SF<sub>6</sub>) is a gas used as an electrical insulator in high-voltage switchgear found in substations. Since SF<sub>6</sub> is a powerful GHG, ENMAX Power closely monitors and reports all SF<sub>6</sub> releases and has stringent SF<sub>6</sub> management practices in place. Since 79 per cent of ENMAX Power substations have SF<sub>6</sub> gas insulated breakers, this gas is monitored by automated alarms and investigated by crews immediately. Any gas loss is documented as part of our regular inspection and reporting process. Additionally, we proactively replace seals to lower the probability of SF<sub>6</sub> leaks from equipment and closely follow industry research to explore alternatives to SF<sub>6</sub> gas. Versant Power assets include 117 substations. Only 35 per cent of those substations have breakers with SF<sub>6</sub>. Versant Power maintains strict control measures to closely manage SF<sub>6</sub> gas releases from its substations and replaces breakers when possible.

## Electrifying our mobile fleet

We have a mobile fleet of 348 vehicles in Alberta that are primarily used to allow our crews to inspect, maintain and repair our transmission and distribution lines, several substations and control centres. Some of these vehicles are also used by our meter readers, community investment team members and for other corporate services. Of this mobile fleet, approximately 39 per cent of vehicles are light duty, 39 per cent medium duty and 23 per cent heavy duty. Last year, we announced our aspirational goal to electrify 100 per cent of our mobile fleet by 2030. As a milestone, we set an interim target to electrify 35 per cent of our mobile fleet by 2025. Despite some challenges related to market availability of electric vehicles (EVs) (arising from pandemic-related global supply chain and labour shortages, among other issues) and components (chip shortages), we advanced toward these targets by:

### MOBILE FLEET ELECTRIFICATION PLAN

We developed a three-year mobile fleet electrification plan that includes our investment in both asset replacement and charging infrastructure. The document outlines our phased approach and intended annual progress toward achieving our 2025 electrification target. The plan will be reviewed annually and updated as technology and market conditions change.

### TESTING NEW TECHNOLOGY

For our medium-duty mobile fleet, we field-tested an Electric Power Takeoff (e-PTO). An e-PTO combines a battery pack, electric motor and hydraulic pump that can raise and lower the boom on a work truck without using diesel. Using e-PTOs would reduce mobile fleet emissions (as well as noise on the job site) since they run on battery power rather than idling the truck's diesel engine.

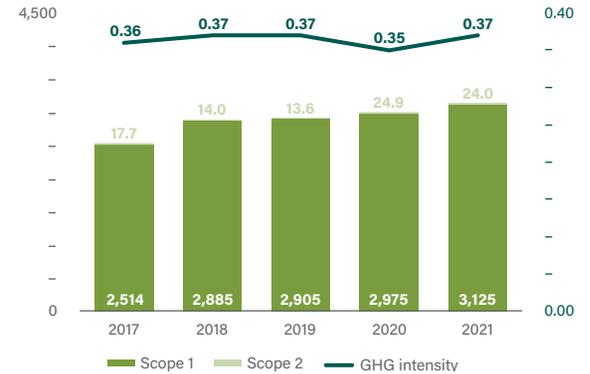
### ADVANCING OUR MOBILE FLEET ELECTRIFICATION PILOT

We entered the second year of our demonstration project to test EV technology on two medium-duty trucks within our mobile fleet. Read more on the [next page](#).

## OUR PERFORMANCE

### GHG EMISSIONS (EQUITY)

kilotonnes of CO<sub>2</sub>e | tonnes CO<sub>2</sub>/MWh



While our emissions intensity remains unchanged over the past four years, our absolute emissions have increased by 24 per cent since 2017. Absolute GHG emissions are directly correlated with the degree of utilization of our assets and our natural gas facilities have very high utilization rates.

#### Notes:

In 2020, we changed the method of consolidation of our GHG emissions. Before this, we reported 100 per cent of the GHG emissions from the facilities we operated, regardless of financial ownership (operational control approach under the GHG Protocol). We have now switched to the equity approach to better reflect financial risks and rewards. Our target baseline (2015) and all data in this chart has been restated using the equity approach.

Our GHG emissions are composed predominantly of CO<sub>2</sub>. While we include SF<sub>6</sub> in our GHG emissions, it represents less than one per cent of our scope 1 emissions.

Emissions from our substations include all SF<sub>6</sub> releases but only a portion of electricity and natural gas combustion, since not all substations are directly metered.

This data excludes Versant Power. The primary source of Versant Power's GHG emissions is gas and diesel combustion from its mobile fleet. The company's mobile fleet includes 140 smaller-class vehicles and approximately 120 medium- and heavy-duty vehicles.

SPOTLIGHT

# Medium-duty pilot advances mobile fleet electrification

Recognized as an important part of global decarbonization, vehicle electrification is rapidly gaining momentum as electric vehicle (EV) technology continues to advance and build future market demand. At ENMAX, we are working towards the full electrification of our mobile fleet by 2030. Adopting EVs into our mobile fleet not only reduces GHG emissions—it also demonstrates the viability of EVs in industrial applications and Calgary's weather conditions and allows us to better understand the impact of transportation electrification on our electricity system.

A key way we are progressing toward our target is by advancing our medium-duty mobile fleet electrification pilot. Initiated in 2019 with funding from Emissions Reductions Alberta, the demonstration project—the first of its kind in Canada—is testing two medium-duty (under 10,000 pounds) fully-electric work trucks within our mobile fleet. The project could see mobile fleet fuel consumption reduced by an estimated 4,300 litres of diesel per vehicle annually.

## Pilot moves to phase two

In the initial phase of the pilot, the truck chassis and body were built and delivered in spring 2022. In early fall 2021, we also installed and put into service two charging stations at our South Service Centre to help us track the performance and usage of the battery and charging infrastructure.

In the second phase of the pilot (now underway) the trucks were fully assembled, delivered to ENMAX, and put directly into operational duty in April 2022. As the trucks are being used, we are analyzing their capacity and performance in various conditions. This includes driving the vehicles in extreme temperatures to determine the effects on range, testing how long the battery lasts with tools in use, and taking trips on less than a full charge.

As the pilot progresses, we will continue to actively engage with suppliers, other utilities and vehicle manufacturers to support the development of the specialized EVs needed to meet our goals.



Our plan for mobile fleet electrification, which includes our medium-duty pilot, was recognized in [Electricity Canada's Centre of Excellence](#) in 2021.



One of the two medium-duty fully-electric work trucks we are testing within our mobile fleet.

## Customer emissions

As part of our essential role in the energy transition, we are committed to first reducing our own impacts and working to help reduce our customers' emissions and costs related to energy consumption over time. In our interactions with customers, we will continue to help them better understand and manage their energy usage and support renewable energy solutions that meet their needs, aspirations and expectations.

### ENERGY USE

We offer My Energy IQ™, a free tool that provides information and reports that enable customers to make informed decisions and better manage their energy use. All residential and small business ENMAX Energy customers have convenient access to the My Energy IQ™ tools, reports and insights as part of their ENMAX Energy online account. My Energy IQ™ enables customers to see how their home compares to similar homes nearby, build a customized savings plan, receive tips tailored to their home, see bill comparisons and historical use charts, learn what consumes the most energy in their home and how weather impacts consumption.

### ELECTRICITY OR NATURAL GAS GREEN ADD-ON

ENMAX Energy offers "green add-on" selections for customers to pay an additional variable fee (the amount is chosen by the customer). For electricity consumption, this fee goes towards the purchase of certified Renewable Energy Certificates that support renewable energy generation, and for natural gas consumption this fee goes towards the purchase of carbon offsets.

### LOWER CARBON EMISSIONS HEATING

Versant Power encourages customers to switch from using fossil fuels for home heating to using electric heat pumps. Since Maine's grid sources about 79 per cent of its electricity from renewable sources such as wind, solar, hydroelectric and biomass, switching to heat pumps results in lower emissions.

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In our interactions with customers, we will continue to help them better understand and manage their energy usage and support renewable energy solutions that meet their needs, aspirations and expectations.

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### SOLAR INSTALLATIONS

As renewable generation continues to expand in Alberta, solar remains the largest source of total installed micro-generation capacity [under five megawatts (MW) in size] at 112 MW as at the end of 2021<sup>1</sup> and ENMAX Energy continues to maintain our position as one of Alberta's leading micro-generation solar installers and retailers with more than 37 MW installed to date. To continue to offer valuable and requested services for our customers, and in response to market drivers, ENMAX Energy will be relaunching our residential and small commercial solar program in 2022. The rooftop solar program will offer competitive pricing and end-to-end customer service through ENMAX Energy. To meet the increasing demand from our larger customers to help meet their ESG goals, we are also exploring renewable electricity sale agreements from utility-scale solar projects.

On a larger scale, customers in municipalities across Alberta have partnered with ENMAX for their solar needs, including 18 MW of installed solar at 58 locations such as Calgary's Shepard Solar Park, Bearspaw Water Treatment Plant and Southland Leisure Centre, to name just a few. In 2021, ENMAX completed and energized the City of Leduc Protective Services' 88.8 kilowatt (kW) rooftop array and the Town of Calmar Arena's 185 kW rooftop array. Toward the end of 2021, ENMAX initiated the Community Solar Fund, providing selected Calgary community associations with rooftop solar installations at their facilities.

There are currently 11 projects in progress (totalling approximately 950 kW), with an additional 15 community associations scheduled in 2022 and an additional expected ~2,200 kW of solar to be installed across Calgary.

### INTEGRATING DISTRIBUTED GENERATION INTO THE GRID

Across the state of Maine, Versant Power is currently supporting more than 200 distributed generation projects through their development stages—from application, engineering studies, design and construction to establishing detailed billing. This involves integrating these renewable projects safely and efficiently within Maine's existing grid and is an important part of advancing ENMAX and Versant Power's shared vision of a cleaner energy future.

<sup>1</sup> <https://www.aeso.ca/market/market-and-system-reporting/micro-and-small-distributed-generation-reporting/>

# Grid reliability and resiliency

## 2021 HIGHLIGHTS



- Invested \$4.5 million in 2021 to enable a more resilient grid.
- Advanced our EV smart charging pilot to understand how Calgarians use EVs and the potential impact on our electricity system.

## WHY IT MATTERS TO ENMAX

Nearly every aspect of modern life relies on electricity. As an operator of transmission and distribution electricity systems, ENMAX Power is advancing technology solutions that will meet customer electricity needs today and into the future. Our electricity grid must continue to deliver power reliably, while enabling the transition to diverse energy sources, withstanding increasingly severe weather events and adapting to changing customer expectations.

## OUR APPROACH

To provide customers with the critical and dependable energy they need, we manage a complex system of infrastructure, equipment and software. We have advanced our ability to predict, detect and respond to outages and are planning and integrating a series of innovative technology solutions to ensure our grid is prepared for the future.

We are advancing technology solutions that will meet customer electricity needs today and into the future.

## Leveraging data analytics

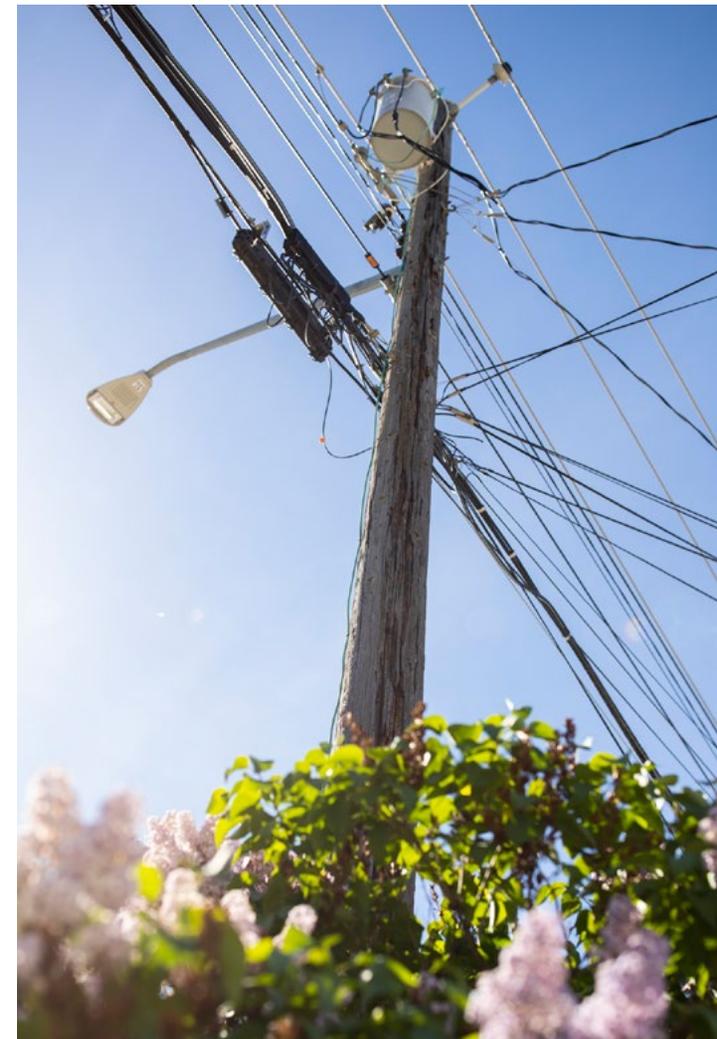
We also use predictive programs and processes to strengthen the reliability of our system, including:

### PLANNING FOR LOAD CAPACITY

To support reliable service to customers, we use load capacity planning to identify the existing constraints and upcoming demands on Calgary's electricity system (loads) and to verify that redundancies are in place. Our interactive [Load Capacity Map](#) uses an ENMAX-developed load forecasting model to help communicate the estimated available capacity throughout our distribution system. Using the map, customers can search for an address to quickly identify the system's available capacity.

### SIMPLIFYING ACCESS TO COMPLEX DATA

In 2021, ENMAX Power developed a System Load Analyzer, an automated approach to identify the customer load at risk under a single unplanned outage using software. Similar to other distribution load flow software, all the different parts of the system (fuses, voltage step-down transformers, switches, overhead and underground conductors) are modeled as sections. Nodes are used to connect sections together and to represent electrical information such as voltage and current. Incorporating a programming language, Python, enabled us to connect the various data sources and display the information in Microsoft Power BI, a tool already in ENMAX's IT environment and accessible to all business units. The resulting platform—called the Digital Twin—is now used by many groups across ENMAX Power to view data and gain insights more efficiently.



SPOTLIGHT

# Delivering power reliably

Strong reliability is linked to building sufficient capacity across the system, but also to our ability to prevent, withstand and recover rapidly from system disruptions. We are strengthening the reliability of our system through:

- INSPECTIONS
- MAINTENANCE & REPAIRS

## DRONES

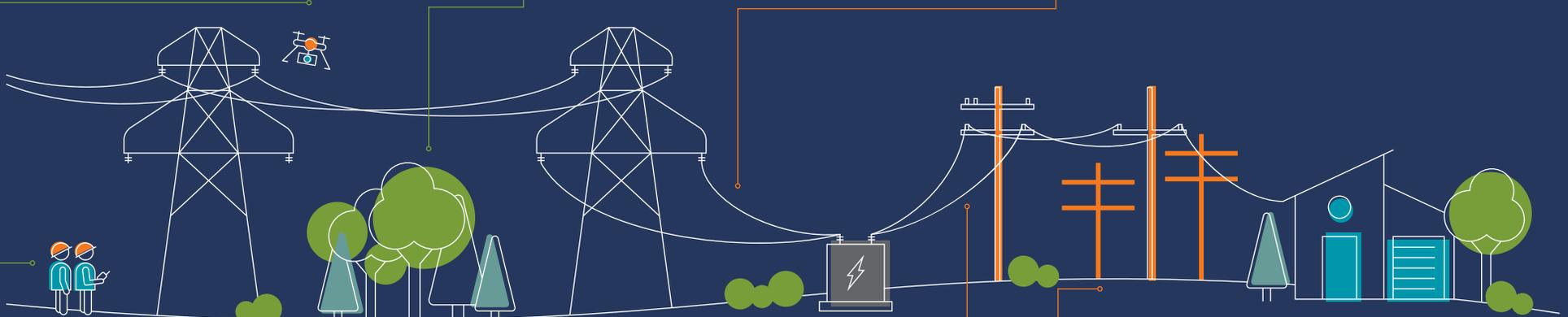
In Maine, drones are increasingly being used to provide top-down inspections of transmission lines in right of ways. Versant Power has 1,270 miles of transmission lines, 900 of which are in a right-of-way. The drones can provide an extremely detailed 360-degree look at the assets, identifying micro-cracks in porcelain insulators, and collecting valuable data.

## TREE AND VEGETATION MANAGEMENT

We use a combination of methods—depending on the voltage of the line—to provide the most effective long-term vegetation control, including manual tree control, brush mowing, tree trimming within the right-of-way and herbicide application. The aim is to remove danger trees that can impact our wires before storms take them down. Part of this work is to reclaim the full width of the right-of-way if it has become narrowed over time.

## THERMAL AND ACOUSTIC

As electrical connections loosen there is a resistance to current that can cause an increase in temperature. In Maine, we use thermal imaging cameras to look for these hot spots which can cause components to fail. We also complete acoustic assessments on our transmission lines, which 'listen' for devices that are slowly breaking down and thereby giving off radio frequency.



## VISUAL INSPECTIONS

We regularly conduct ground line visual inspections to provide a bottom-up look at our assets in Alberta and Maine. Typically, one to two inspectors complete these vehicle or foot patrol assessments from the road with binoculars and often use infrared or corona scanning to look for any signs of degradation. These inspections also include wood pole condition assessments in which we make a small drill hole to determine pole strength and whether there is any rot.

## COVERED CONDUCTOR PROGRAM

Each year in Maine, Versant Power analyzes line sections (one to two miles) with low reliability metrics and installs covered conductors. If a tree falls on a bare wire, it can result in an outage. With covered conductors, the insulation protects the wire so there is no short.

## REPLACING AGING ASSETS

Each year, certain assets undergo major maintenance or replacement as part of ENMAX Power and Versant Power's Capital Asset Replacement Program. This program helps our assets run optimally and minimizes the occurrence of outages. Assets are prioritized based on condition and other risks.

## Measuring our reliability

ENMAX Power is committed to delivering power safely and reliably. In Alberta, we operate under [Alberta Reliability Standards](#)—the requirements followed by the Alberta Electric System Operator and all electricity market participants in the province to maintain high reliability within the Alberta Interconnected Electric System. We deliver reliability levels that are top quartile in Canada (see data from [Electricity Canada \(EC\)](#) in the sidebar).

In Maine, Versant Power has improved across all reliability metrics over the last few years (see table below). To meet increased customer expectations for power reliability, Versant Power currently invests more than \$70 million USD annually (approximately \$87 million CAD) to maintain and improve its distribution system.

## Managing and communicating outages

ENMAX Power's Outage Management System estimates the origin of an outage in order to efficiently dispatch a service person to the location for restoration. The system also automatically identifies and posts outage information for customers via Twitter and on an integrated website map (the [Calgary Outage Portal Map](#)), which shows unplanned outages occurring real-time and within the last 24 hours.

| RELIABILITY STATISTICS – VERSANT POWER  | UNIT                         | 2018 | 2019 | 2020 | 2021 | CHANGE      |
|---|------------------------------|------|------|------|------|-------------|
| System Average Interruption Duration Index (SAIDI) <sup>1</sup>                                   | hours                        | 6.62 | 5.04 | 5.03 | 3.63 | <b>-45%</b> |
| System Average Interruption Frequency Index (SAIFI) <sup>2</sup>                                  | # interruptions per customer | 2.52 | 1.96 | 2.27 | 1.97 | <b>-22%</b> |
| Customer Average Interruption Duration Index (CAIDI) <sup>3</sup> , inclusive of major event days | hours                        | 2.63 | 2.58 | 2.21 | 1.84 | <b>-30%</b> |

## Minimizing the impact of outages

Despite our best efforts, some of our customers experience power outages. To minimize the impact on our customers, we invest in:

### AUTOMATED OUTAGE RESTORATION

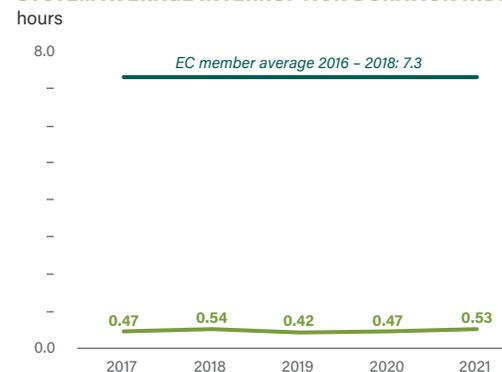
To substantially reduce the duration of outages and the number of customers affected, approximately 48 per cent of Calgary's non-downtown distribution system uses a technology called Distribution Automation. This system has saved an estimated 30 million minutes of outage time over the past 10 years. Distribution Automation is self-healing and uses SCADA (supervisory control and data acquisition) systems to detect a fault, automatically isolate it and rapidly restore the system.

### INTELLIGENT DEVICES

Similar to Distribution Automation in Alberta, Versant Power has installed 65 intelligent devices in Maine since 2019. They require no operator, and they automatically detect a fault, isolate it, and rapidly restore the system.

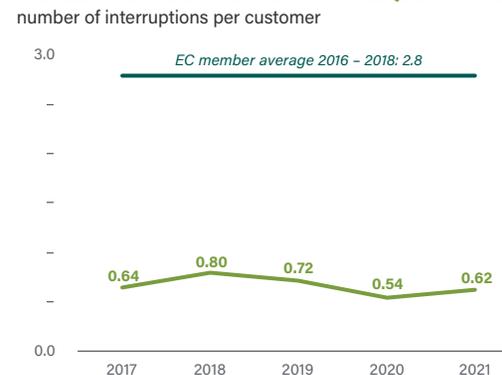
## RELIABILITY STATISTICS – ENMAX POWER

### SYSTEM AVERAGE INTERRUPTION DURATION INDEX (SAIDI)



SAIDI reflects the cumulative duration (in hours) of sustained repair outages experienced by the average customer in a year. On average, our customers experience less than 30 minutes of power interruption during one year, while customers of EC member companies experience, on average, seven hours of outages per year.

### SYSTEM AVERAGE INTERRUPTION FREQUENCY INDEX (SAIFI)



SAIFI reflects the number of power outages lasting longer than five minutes experienced by the average customer in a year. On average, our customers experience fewer than one outage per year.

<sup>1</sup> SAIDI represents the total duration of a sustained interruption per average customer during a predefined period of time. A sustained interruption has a duration greater than or equal to five minutes.

<sup>2</sup> SAIFI represents how often the average customer experiences a sustained interruption over a predefined period of time. A sustained interruption has a duration greater than or equal to five minutes.

<sup>3</sup> CAIDI represents the average hours of service interruption for customers who experience a service interruption. The Institute of Electrical Electronics Engineers defines a 'sustained' outage as one that is five minutes or longer. This is a known distinction from Canadian utilities.



## PROGRESS IN 2021

Adapting to the pace of change in our industry while maintaining a reliable and resilient grid requires innovative thinking and concerted investment. Last year, we set a target to invest \$60 million by 2030 to enable a more resilient grid while maintaining our reliability levels. We remain dedicated to this goal and have allocated \$4.5 million in the first year.

## Acting today to enable the grid of tomorrow

We invest in innovation to make the grid more flexible, support lower carbon power generation and adapt to changing customer needs.

### TESTING SMART METER TECHNOLOGY

ENMAX Power is running a pilot project to test smart meters (known as Advanced Metering Infrastructure, or AMI) in a few Calgary communities to improve our metering capability and provide customers with actionable insights on their energy consumption. Read more on [page 58](#).

### PILOTING RESIDENTIAL BATTERY STORAGE

ENMAX Power is working with a small number of customers in targeted areas of Calgary where there is potential for congestion on the grid. We are looking at ways to work with customers that have solar photovoltaic (PV) installations, possibly combined with electric vehicle charging, to install residential batteries so they can store that power and then either use it in their home or export it back to the grid.

### SUPPORTING SOLAR MICRO-GENERATION

In 2022, we are relaunching our residential and small commercial solar program to support customers' demand for renewable power. Read more in the [Customer Emissions](#) section of this report.

### PREPARING FOR ELECTRIC VEHICLE ADOPTION

Electric vehicle (EV) adoption is increasing rapidly and EV charging (mostly done at home or work) will increase electricity demand for utilities like ours. Since 2019, we have been progressing our understanding of EV charging behaviours. Read more in the sidebar about our Charge Up pilot.

## STORY

### CHARGE UP PILOT: SUPPORTING TRANSPORTATION ELECTRIFICATION

EVs are no longer a distant conversation—the Canadian federal government has set a mandatory target for new light-duty cars and trucks to be zero-emission EVs by 2035. Adjusting the grid to this rapid shift requires investing in innovation like Charge Up, our EV charging pilot, which is helping us understand how Calgarians use EVs and the impact on our electricity system.

Phase one of the pilot was focused on charger installations and baseline charging behaviour. We provided customer rebates for the installation of 35 residential chargers and customers agreed to share their charging data with ENMAX for five years. In this phase, we observed that EV charge times generally coincide with evening peak electricity demand and that short duration charging is common.

Building on these findings, we launched the second phase to understand the factors that influence charging behaviour (i.e., education and/or incentives) and to test smart charging, the concept of using an intelligent approach to decide when and where people charge their vehicles. We developed a randomized trial to test the effectiveness of smart charging using two different incentive structures against a control group. The trial is Alberta's first smart charging program that will reward customers for choosing to charge at times that benefit the grid. We hope to use these findings to develop future programs that incentivize EV charging behaviour that optimizes the use of our distribution system.



WANT TO LEARN MORE?

[Click here to watch a video about our Charge Up pilot program.](#)

SPOTLIGHT

# Enabling customers to export renewable power to the grid

Dedicated to meeting our customers' changing needs, ENMAX is working to solve a problem impacting electricity grids across North America—enabling customers on secondary networks to export excess electricity back to the grid.

A secondary network is a complex power grid with a web of multiple parallel sources of power to each customer. These specialized networks are used to supply electricity to high-density communities requiring high reliability. Within Calgary, ENMAX Power has four secondary networks (CF Chinook Centre, North Hill Centre, Westbrook Mall and the downtown core). Customers connected to a secondary network rarely experience interruptions in power, but the existing design of these systems does not allow customers who own electricity generation to export excess power back to the grid. Although this is done for safety and reliability reasons, it creates a technical barrier to adopting distributed generation in these areas.

ENMAX Power is the first utility in Canada to develop and demonstrate a solution to this complex technical challenge through a multi-year project funded in part by Natural Resources Canada and Alberta Innovates. In collaboration with Cadillac Fairview (CF), the project will test the connection of a solar installation at CF Chinook Centre, the largest shopping complex in Calgary, onto ENMAX Power's specialized secondary network to enable two-way power flow of renewable forms of energy.

In April 2021, the project took an important step forward when we began construction of the 800 kW DC onsite solar installation on the CF Chinook Centre rooftop. Construction of the systems that allow for electricity export was completed in the first quarter of 2022, after which we began the final phase of testing and monitoring of the two-way power flow. The technology, if proven successful, will help remove technical and financial barriers to distributed generation, giving residential and commercial customers in urban settings more choice in how they generate and use electricity, while building the resiliency of the grid.



# Emergency preparedness and crisis management

## WHY IT MATTERS TO ENMAX

Reliable power generation and delivery depends on both maintaining our assets and on restoring power when outages or emergencies occur. The last two years have intensified our resolve to enhance our resiliency and ensure business continuity and power delivery through a variety of crises.

## OUR APPROACH

We use the internationally recognized [Incident Command System \(ICS\)](#) to manage our emergency response. ICS is a standardized command and control system used to manage emergency incidents. We maintain a regularly reviewed Incident Management Plan, which contains all emergency response plans and protocols. Our emergency preparedness is tailored by our power generation and transmission and distribution teams:

### Power generation

Emergency preparedness at ENMAX Energy means ensuring our generation facility control centre, field and power plant employees are equipped to respond safely, while maintaining compliance to all legislative requirements of the Alberta Interconnected Electrical System. Our employees receive emergency response training as part of their operational training and during regular emergency exercises. Each year we conduct a combination of full-scale/virtual tabletop exercises, and pandemic-type exercises are now part of our scenarios.

## Transmission and distribution

ENMAX Power is a partner member of the Calgary Emergency Management Agency (CEMA), which plans and coordinates emergency services and resources during major emergencies and disasters in Calgary. We participate in all their drills, exercises and preparedness planning, along with our neighbouring utilities. This collaboration supports public and staff safety, minimizes damage to electrical infrastructure, and allows for faster recovery and return to normal operations, resulting in less disruption to our customers. As a key CEMA member, we have seats at their Emergency Operations Centre, which opens during disasters or major emergencies and acts as The City of Calgary's coordination centre. To test the real-time effectiveness of our response, we also complete one full-scale exercise per year with one of our closest mutual assistance partners, EPCOR. These exercises are multi-agency, multi-jurisdictional activities involving the mobilization of emergency personnel, equipment and resources, as if a real incident had occurred. Our aim is to complete one emergency response exercise per quarter.



We completed 25 emergency exercises in 2021 and advanced our preparedness for extreme weather events such as floods and snowstorms.

## PROGRESS IN 2021

In 2021, we completed 25 emergency exercises across ENMAX. The exercises included a combination of full-scale and/or virtual tabletop exercises at Shepard Energy Centre, Calgary Energy Centre and Cavalier Energy Centre. At Versant Power, 12 emergency response exercises were completed in 2021.

### Preparing for extreme weather events

In 2021, Calgary saw both record low and record high temperatures and Western Canada experienced a wide range of extreme events including forest fires, extreme winds and severe floods. Although our assets were not significantly impacted, we dedicated time and focus to prepare for these types of events. During the year, ENMAX Power held three weather-related tabletop exercises, two related to flood and one simulating a large snowstorm. Tabletop emergency exercises are sessions in which team members discuss their roles during an emergency and their responses to a particular situation, with a facilitator guiding participants through the scenario. Our exercises involved representatives from field services, senior leadership, communications and system operations. Some of the learnings from these exercises included improvements to our ICS organizational structure to enable more effective two-way communication and providing better support to our system operators and trouble dispatchers to assign jobs to crews for secondary outages that can occur during storms.

# Water use and quality

## WHY IT MATTERS TO ENMAX

We recognize water is a precious resource that must be used responsibly. We carefully manage our water withdrawals and monitor our wastewater disposal.

## OUR APPROACH

The majority of our water use is for essential power generation processes—intake water is used for cooling purposes in cooling towers and the remainder is purified onsite to create steam in our combined-cycle power plants. Combined-cycle facilities extract waste heat from the gas turbine exhaust and use it to create high pressure steam which produces additional electricity when allowed to depressurize. Our water reduction initiatives have been focused on reducing facility water intensity by:

### Reducing potable water use

We strive to minimize potable water use by using as much reclaimed water in our operations as practically possible. Reclaimed water is wastewater that has been processed for reuse for an additional purpose before passing back into the water cycle. By design, our largest generating facility, Shepard Energy Centre, uses 100 per cent reclaimed water from The City of Calgary's Bonnybrook Wastewater Treatment Plant for all its power generation needs. Each year, this saves the plant from having to draw nearly six million cubic meters (m<sup>3</sup>) of freshwater from the Bow River.

## Optimizing our water use

We seek to optimize water use at our operated facilities in the following ways:

### SHEPARD ENERGY CENTRE

While this facility already uses reclaimed water, we have sought to further optimize its water use. The water used in a power plant declines in quality each time it runs through the facility, where every pass through the cooling towers increases the concentration of dissolved substances. After three years of research, observation and innovative lab testing, we found the optimal operating efficiency of the cooling towers. This work, which was [recognized by Electricity Canada](#), has increased the reuse cycles from 3.5 to 5, while still maintaining all cooling water chemistry within required concentration limits. This initiative has reduced the plant's annual wastewater volume by 24 to 28 per cent (compared to 2017 values) and reduces wastewater discharged by 450,000 m<sup>3</sup> each year.

### CALGARY ENERGY CENTRE

We examined our water use at this facility and determined that the plant is already optimizing its water use to the extent possible with existing technology.

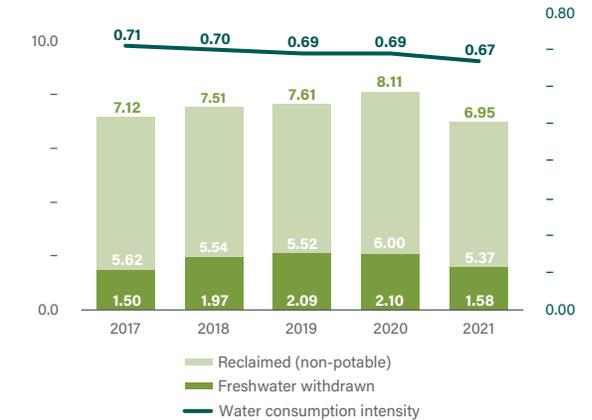
### CAVALIER ENERGY CENTRE

This facility is located just east of Strathmore and gets its water from an irrigation canal connected to the Bow River. While using water from this source presents challenges due to source water quality, Cavalier uses a complex process to recycle and treat water at a very high rate of efficiency, leaving very little that cannot be recycled.

## OUR PERFORMANCE

### WATER USE

million m<sup>3</sup> | m<sup>3</sup>/MWh



Most of the water we use is non-potable and for power generation cooling processes.

### WATER WITHDRAWAL

~70% of our water withdrawn is reclaimed (non-potable) water

### WATER CONSUMPTION AND DISCHARGE

~80% of water evaporates through the cooling process

~20% of the total volume is returned to the municipal sewer system after use

~0.2% is water that can no longer be reused and is disposed of through deep well injection

## Water quality

We comply with all City of Calgary bylaw requirements for wastewater disposal in Calgary, which applies to Shepard Energy Centre and Calgary Energy Centre. This includes requirements for handling, treatment and disposal. At Cavalier, wastewater is reused to a point where it can no longer be treated and is disposed of using deep well injection in accordance with provincial regulations. More than 99 per cent of ENMAX's wastewater is treated at The City of Calgary's wastewater treatment plants.

# Air quality

## WHY IT MATTERS TO ENMAX

ENMAX Energy operates power generation facilities in Calgary and the surrounding urban area and takes its role seriously in helping to protect local air quality. In addition to GHG emissions, our operations generate other air emissions that can impact air quality.

## OUR APPROACH

We diligently track and report air emissions from our power generation facilities. We are working to reduce these emissions by incorporating emissions reduction technologies, adhering to best practices and maintaining our commitment to continuous improvement.

## Nitrogen oxides

We operate our facilities well below our allowable nitrogen oxide (NOx) levels, which are facility-based NOx limits granted by Alberta Environment and Parks (AEP) and provincial regulations. To maintain these emissions levels, we utilize a combination of pre and post combustion NOx reduction technologies at our natural gas-fuelled power generation facilities. Two of our power generation facilities use post-combustion exhaust gas treatment (ammonia injection) to reduce NOx emissions. Crossfield Energy Centre has installed low-NOx combustors and Cavalier Energy Centre uses water injection into the turbine to control NOx.

## Sulfur oxides

Sulfur oxides (SOx) are no longer a significant source of our overall emissions since the termination of our coal-fired Power Purchase Arrangements. Our SOx emissions levels vary in relation to the volume of our power generation output (see data in the sidebar).

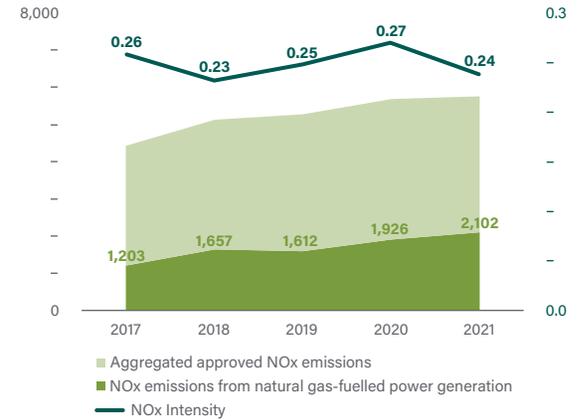
## Partnerships to protect air quality

We participate as an industry member of the Clean Air Strategic Alliance (CASA) and Calgary Region Airshed Zone (CRAZ) to represent our power generation assets. CASA is a multi-stakeholder partnership created to help manage air quality in Alberta. The board has representatives from industry, government and non-government organizations. CRAZ monitors, analyzes, and provides information on air quality and develops strategies to manage air quality issues within the Calgary Region Airshed Zone.

## OUR PERFORMANCE

### NOx EMISSIONS

tonnes | kg/MWh



We maintain NOx emissions levels from our power generation facilities well below our allowable NOx levels. However, to reduce excessive wear on equipment, we have had to reduce ammonia injection (one of our NOx reduction methods) and, therefore, have seen an increase in absolute NOx emissions levels when compared to previous years.

We generate other air emissions in smaller quantities and while there are no operational approval limits attached to these emissions, ENMAX tracks these quantities annually.

### OTHER AIR EMISSIONS (TONNES)

|  | 2017 | 2017 | 2019 | 2020 | 2021 |
|--|------|------|------|------|------|
| SOx                                    | 13   | 16   | 16   | 17   | 13   |
| Particulate matter (PM <sub>10</sub> ) | 25   | 14   | 15   | 15   | 12   |

Note: Air emissions data includes only our power generation assets over which we have operational control.

# Land and biodiversity

## WHY IT MATTERS TO ENMAX

Environmental protection and stewardship are integral components of our strategy embedded across all aspects of our business. We endeavour to provide environmentally responsible energy solutions to the communities we serve.

## OUR APPROACH

At ENMAX, we conduct our business with respect for living species and the land around our operations. We have an established environmental management system, clear data collection and reporting processes, and strong internal procedures to manage our environmental risks. Our environmental management system is modeled after [ISO 14001:2015](#), an international standard for environmental management.

## Land stewardship

ENMAX Power operates over 38,000 distribution pad mounted transformers, 113 high voltage substation power transformers and 43 substations. While we continually work to prevent spills in our daily operations, we do experience some releases. In 2021, we had three significant<sup>1</sup> transformer spills. Two distribution transformer spills, one caused by third-party damage and one as a result of a faulty drain valve. The third spill involved a substation transformer release due to a radiator fin failure. Some of the ways we are working to reduce spills and improve our land stewardship practices include:

## PROACTIVE SPILL PREVENTION AND RESPONSE

We have established routine inspection programs to assess the health and condition of our generation, distribution and transmission equipment. As part of the inspection program, the assessment of oil-filled equipment is critical as leaks can lead to equipment failure, electrical outages, and costly site clean-up and/or remediation. When minor leaks are identified, we increase inspection frequency to allow for ongoing monitoring and assessment of the equipment's leak severity. In instances where a leak condition progresses or a major leak or equipment damage is identified, we schedule the repair or replacement of the equipment, including any site clean-up or remediation required. We also have spill response and reporting procedures in place to address spills due to equipment failure, including damage and releases caused by third parties.

## HYDROVAC SLURRY MANAGEMENT

We use hydro vacuum excavation, or hydrovac, to safely excavate around buried cables that need repairs. Hydrovac uses high-pressure water to loosen the soil and dig a hole. The muddy excavated material, or slurry, is then suctioned into a tank mounted on a specialized truck and taken to a designated facility. Although a common industry practice, new regulatory guidance has highlighted additional required environmental considerations. In 2021, ENMAX completed significant refining of our processes around pre-characterizing soils prior to hydrovac excavation. By clearly identifying contaminants in soil, we can determine the best means of disposal or potential for reuse.

## STORY



## GOATS PROVIDE NATURAL WEED CONTROL

In June 2021, our Cavalier Energy Centre hosted 270 goats to graze on weeds as a means of environmentally friendly weed control. Goats can safely eat noxious weeds and help regenerate the soil by aerating, mulching, and fertilizing.

The herd from Goats for Weeds returned to Cavalier for a second go-round later in the summer. After repeat visits at our facility, the weed management program with the herd will shift from initial clearing to basic maintenance, saving time, money, and reducing environmental impact compared to traditional herbicide treatments.

<sup>1</sup> A significant spill is defined as more than 500 litres, in alignment with industry standards (including Electricity Canada).

## Protecting biodiversity

Birds often use power poles or substation equipment for perching, roosting and nesting. Birds may also nest in areas where project or maintenance work will be carried out. Across our operations, ENMAX works to protect birds while helping to ensure the reliability of our services by identifying high-risk areas, conducting nest sweeps prior to work, and delaying work to accommodate nesting periods.

### PREVENTING DISTURBANCE TO NESTING BIRDS

To avoid disturbing avian nesting and breeding habitat we regularly perform nest sweeps prior to project work. Nest sweeps involve a search of the immediate area by trained biologists to look for breeding birds and nests. After completing a sweep, if nesting birds are discovered, we identify locations where we can complete our work without disruption to the birds and we relocate our crews to these areas. In 2021, we completed several sweeps as part of our work on the Calgary Ring Road project. Many different nesting sites were identified and we were able to accommodate the nesting period without any incidents.



Across our operations, we work to protect birds while helping to ensure the reliability of our services.

### NESTING PLATFORMS

In Maine, around coastal areas, ospreys tend to build nests at the top of utility poles, which presents a danger to the birds and raises the risk of disruptions to electric service. After a 2020 incident when an osprey built a nest on a utility pole in Lamoine, Versant Power crews wanted to prevent a future safety risk to the birds as well as the public. As a result, Versant employees designed and built an alternate osprey nesting platform close by. The platform was built with osprey preferences in mind and required Versant's environmental team as well as the expertise of outside environmental groups, including the Maine Department of Inland Fisheries and Wildlife. Because ospreys like to be at the tallest point above the water, Versant crews replaced an existing utility pole with a taller one. Crews installed a square platform with no coverings, as the birds prefer to look down and hunt for fish below without any obstructions overhead. The osprey camera (powered by [EarthCam](#)) is powered entirely by solar energy and is situated on a newly built osprey platform overlooking the Mud Creek.

As Calgary has several fish-bearing waterbodies, osprey are common and ENMAX maintains and monitors 17 nesting platforms to provide safe places for osprey to nest.

