FORTIS ALBERTA

Electric Vehicle Smart Charging Pilot Results
Technical Report

Published: August 2025

FORTISALBERTA'S VISION, MISSION, PURPOSE AND VALUES

The Company's **Vision** is about the "who" – it's an ambitious statement, expressing our primary long-term goals and our intention out in the world.

The Company's **Mission** describes the "what" – it's pragmatic and functional, and can be compared to the head of the Company's body.

The Company's **Purpose** explains the "why" – it's inspirational and has an emotional connection for employees; it's the Company's heart.

The Company's **Values** form the compass that keep employees pointed in the desired direction.

FortisAlberta's Vision, Mission, Purpose and Values may look and sound very familiar since we've been living them for years.

Vision

We lead by example, innovate with purpose, and champion sustainable change so we can power the future Albertans deserve, together.

Mission

To deliver safe, reliable electricity in a cost-effective manner to our customers, create value for our shareholder, and be a great employer and corporate citizen.

Purpose

We are FortisAlberta. We deliver the electricity that empowers Albertans to succeed. We keep the power on, not just because it's our job, but because we care about the people we serve. We are reliable, honest and dedicated to our work because our employees, customers and communities matter to us.

Values

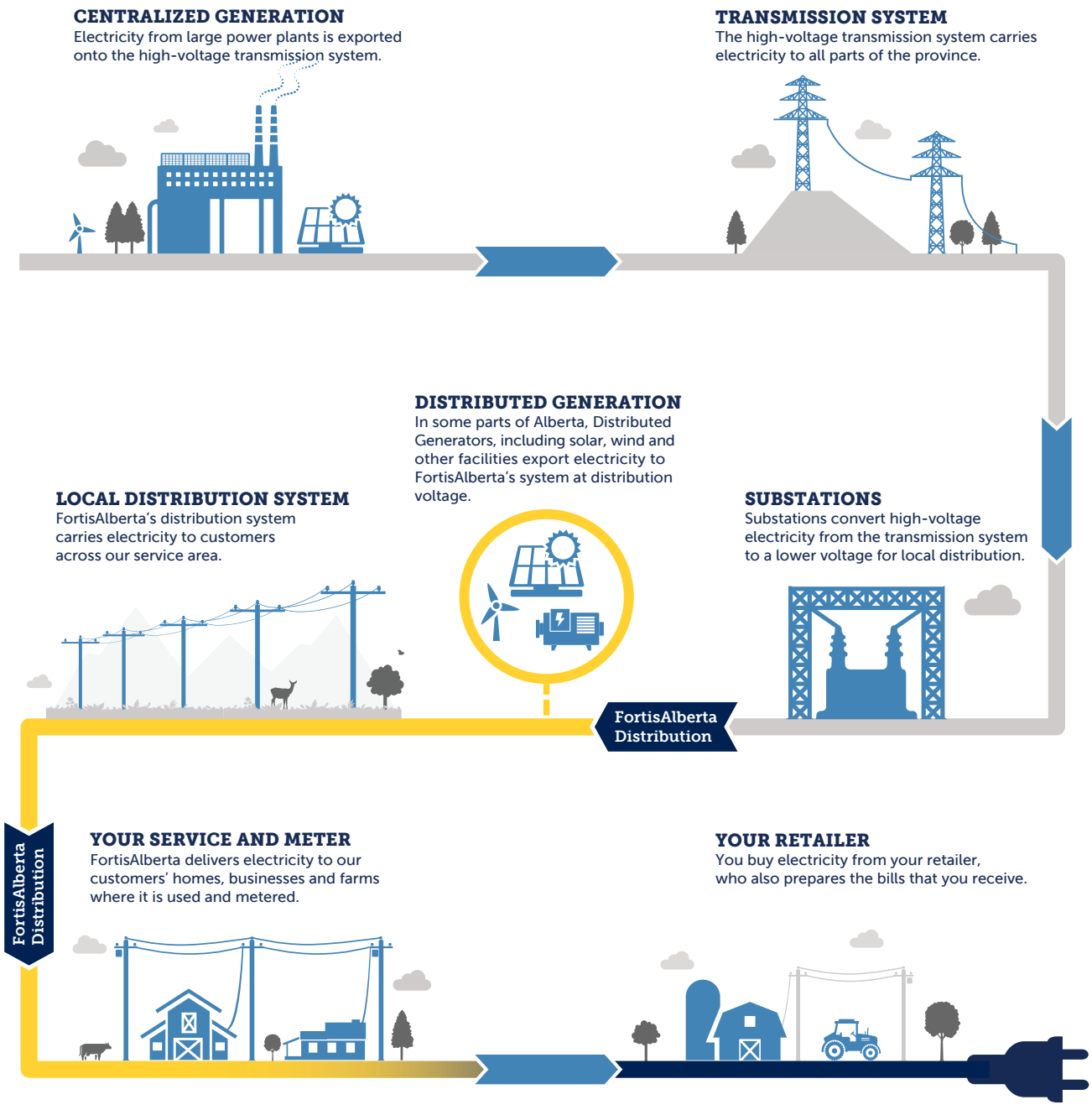
Core Values are a representation of who we are and what we stand for; it's a shared belief system, shared between FortisAlberta, our customers and the communities we serve. The following five values work collaboratively together to uphold our strong reputation and brand:

- **Safety** – We perform our work safely, so we all return home to our loved ones each day
- **Integrity** – We are honest and ethical in the work that we do
- **Respect** – We embrace diverse perspectives, ideas and identities
- **Excellence** – We strive to improve in everything we do, holding ourselves accountable to each other and our customers
- **Service** – We work collaboratively to be responsive to our customers and our communities

FORTISALBERTA: WHAT WE DO

FortisAlberta is a wholly owned subsidiary of Fortis Inc., a leader in the regulated gas and electric industry that serves 3.4 million utility customers, in 10 regulated utilities across Canada, the United States, and the Caribbean. At FortisAlberta, we deliver electricity to more than a half-million residential, commercial and industrial customer sites across central and southern Alberta. At the heart of this system are over 1,300 employees, who live and work in the province of Alberta and are committed to making sure safe and reliable electricity reaches every individual customer.

FortisAlberta's business is highlighted in yellow.



Electric Vehicle Smart Charging Pilot

In January 2023, FortisAlberta Inc. (FortisAlberta or the Company) launched an Electric Vehicle (EV) Smart Charging Pilot (the Pilot), which was approved by the Alberta Utilities Commission as part of FortisAlberta's 2023 Cost of Service application. The Pilot ended in June 2024 with nearly 320 EVs enroled across 57 of the 240 communities in the FortisAlberta service area.

This document describes, at a high level, the questions posed in the Pilot as well as the insights that were gained.

It takes a combination of customer participation and technology to make a program work and FortisAlberta thanks the participation of customers that helped make this pilot successful.

Pilot and Timelines

The Pilot focused on investigating these main questions.

1. How are FortisAlberta customers charging their EVs today and how could EV charging impact the grid both now and in the future?

2. How could demand side management (DSM) mitigate grid impacts resulting from EV charging, and how does managed charging compare to time-of-use (TOU) rates?

3. To what extent are customers willing and what incentives will they require to participate in managed charging programs?

DSM provides customers with incentives to lower or shift their electricity use. This can help reduce demands on the electricity system, leading to system optimization, and deferral of traditional upgrades to the electrical grid (i.e. wires and/or generation). DSM can incentivize customers to shift when they charge their EVs that can reduce stress on the electric grid during peaks.

The Pilot design included a comparison of managed charging and TOU incentives.

Managed charging uses an algorithm to automatically adjust charging so that the charging of multiple EVs is staggered such that they don't all charge at the same time. Participants in the managed charging program received incentives for allowing the algorithm to manage their vehicle charging. TOU participants received incentives for charging their vehicle at specific times of the day outside of peak electricity use, for example, from 10 p.m. to 6 a.m.

THE TEAM

The Pilot project team included members from FortisAlberta's Emerging Customer Solutions and Engineering teams, a research team from the Net Zero Electricity Research Initiative that included faculty members from the University of Calgary and the University of Alberta, and Optiwatt, the EV charging solution provider.

THE TIMELINE

The EV Smart Charging Pilot involved three phases, with each phase lasting approximately six months. Each phase, illustrated in Figure 1 below, concluded with a survey to track satisfaction and gain insights from participants.

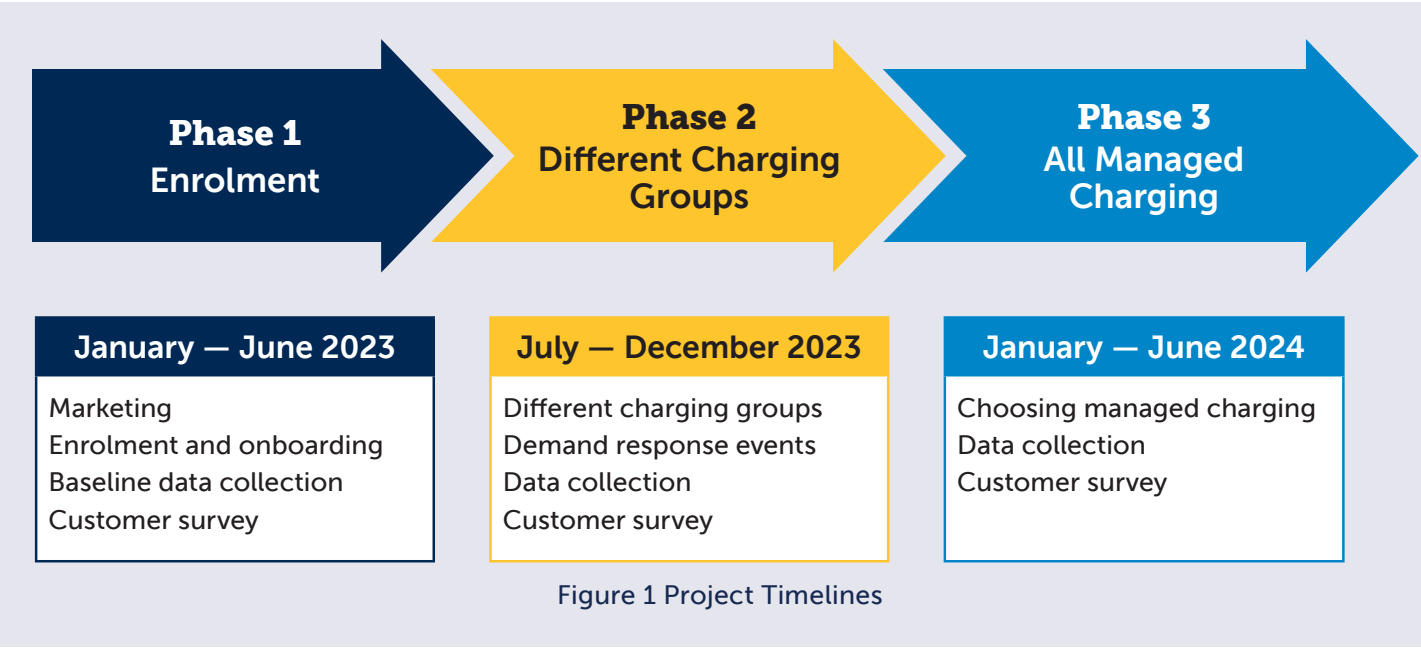


Figure 1 Project Timelines

Phase 1: Enrolment and Baseline Data Collection

January to June, 2023

Phase 1 of the Pilot included marketing to potential participants, enrolling and onboarding participants, and collecting baseline data. Participants joined as Optiwatt users through the Optiwatt app and then were able to enrol in the Pilot from within the app. Baseline data was necessary to show how participants were charging their EVs before charging incentives were put in place. Participants were recruited through social media advertising, digital displays, press releases through news outlets, and affiliate advertising through businesses. The baseline data collected in Phase 1 was used in Phase 2, and Phase 3 of the Pilot to measure changes in participant charging behaviour.

Phase 2: Different Charging Groups

July to December, 2023

In Phase 2, participants were randomly assigned to three different charging groups:

Group 1: Control group (charge-as-you-wish), where no additional instructions or incentives were provided to participants.

Group 2: Simulated TOU group where participants received a $0.035/kWh incentive for charging at home during two incentive windows, from 10 a.m. to 2 p.m. and from 10 p.m. to 6 a.m.

Group 3: Managed Charging group where participants received the same $0.035/kWh incentive as the TOU group to have their home charging managed by Optiwatt's charging algorithm. These participants used the Optiwatt app to set the battery percentage they required and the time they needed to leave each day (i.e. battery target of 80 per cent and charged by 6 a.m.). The participants plugged their vehicle in to charge, and the app used the participants' inputs and grid conditions to manage when energy was delivered to the battery. Participants could opt-out of a managed charging session if they needed to have their vehicle charged as quickly as possible, but did not receive a charging incentive for charging sessions where they opted-out.

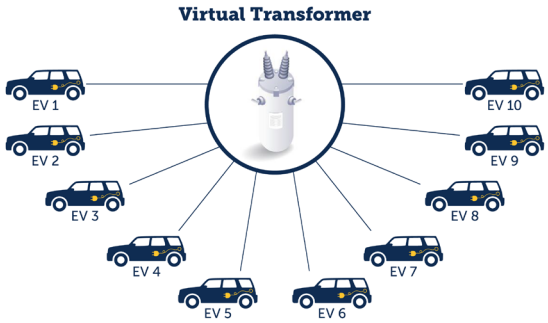


Figure 2 Virtual Transformer

Virtual Transformer Groups

FortisAlberta has a large service area and currently EVs are fairly spread out across the territory. There are not many transformers with more than one EV connected to them and where it does occur, it is usually due to a household with more than one EV. To investigate the impact of transformers where every household has an EV, participants were randomly assigned to virtual transformer groups made up of 10 vehicles per transformer shown in Figure 2. The randomization included assigning the virtual transformer groups to one of the three charging groups, shown in Figure 3.

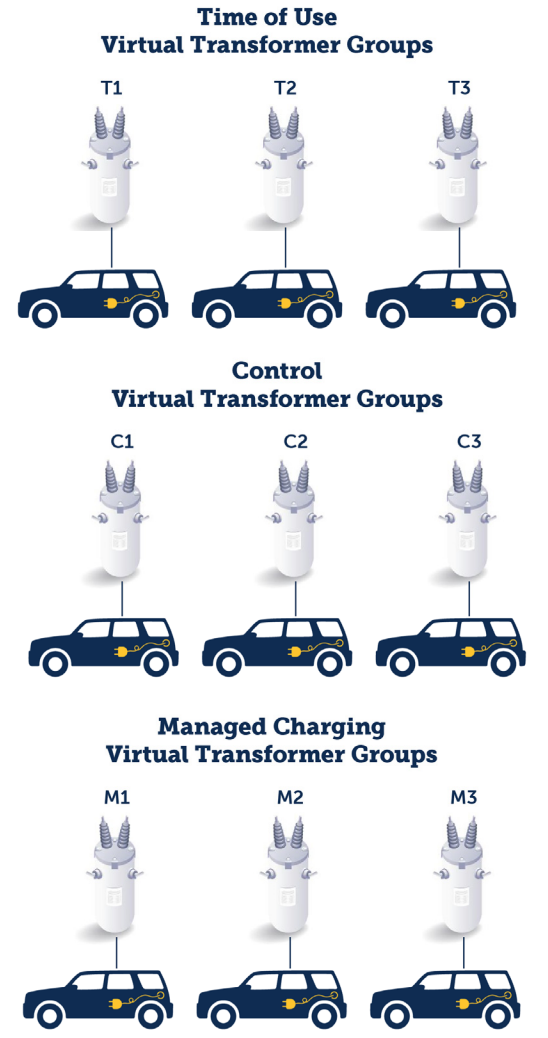


Figure 3 Virtual Transformer Groups

Figure 4, below, shows a graph of typical daily electricity use from midnight to midnight.

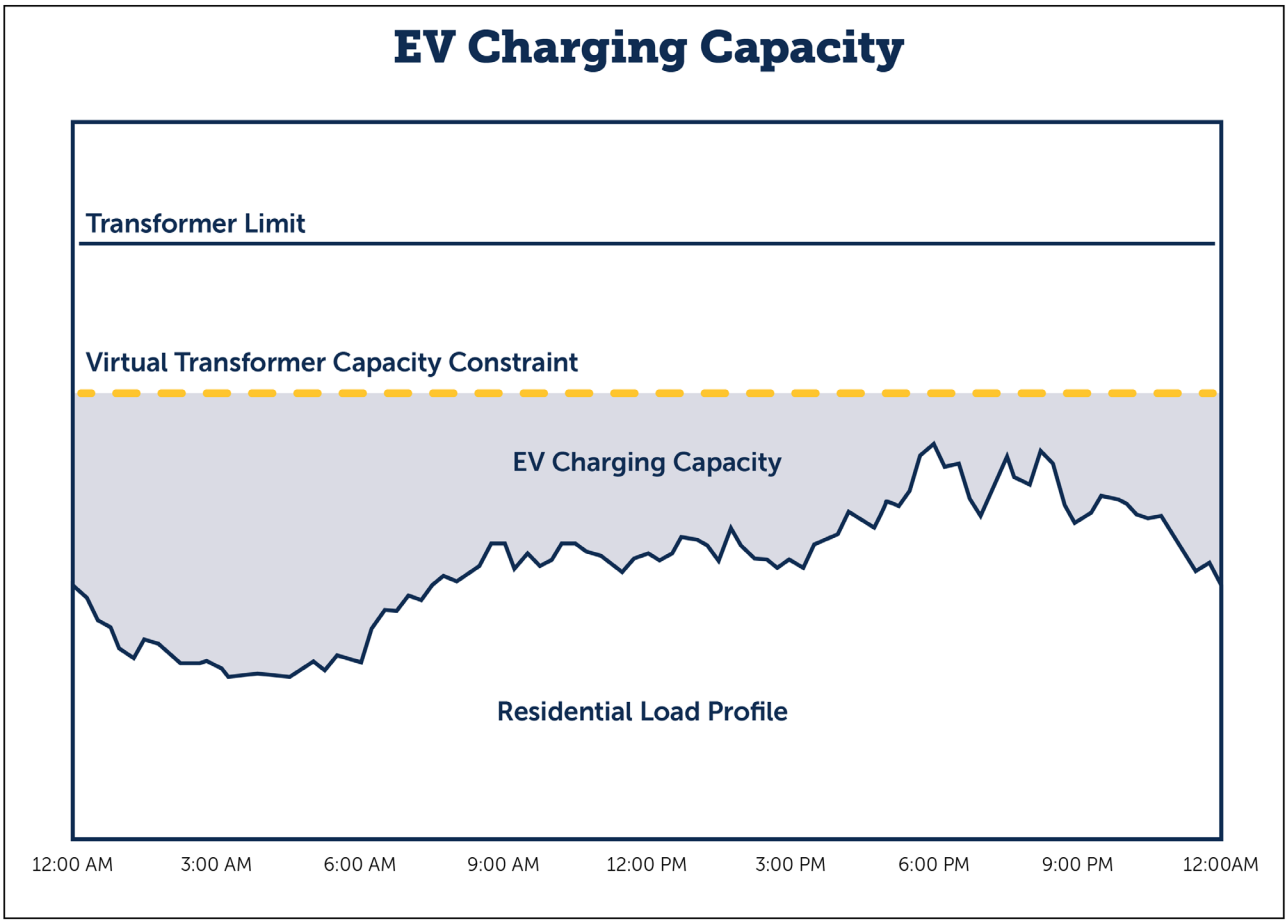


Figure 4 Virtual Transformer Limit

This graph represents the capacity of the transformer, and the amount of load supplied by it, through the 24 hours of a single day, from midnight to midnight. The line at the top of the figure represents the transformer limit. This is a constant value and represents the rated capacity of the transformer, i.e. the amount of energy it can supply on a continuous basis without overheating and failing.

The white area at the base of the figure labelled 'Residential Load Profile' represents the base load of the 10 customers' homes supplied by the transformer and does not include any EV charging load. This is the combined usage of the 10 customers, at each point in time throughout the day. Energy usage fluctuates throughout the day as customers use electrical devices in their homes or turn them off. This includes such things as ovens, water heaters, fans, air conditioners, electronics, and clothes dryers. The load supplied by the transformer is lowest in the early morning hours when most people are sleeping, increases in the morning, and increases even more in the late afternoon and early evening when most residents are back in their homes.

At each point during the 24 hour period, the remaining available capacity of the transformer for that point in time can be determined by subtracting the value of the residential load profile from the transformer capacity limit.

For the purposes of the EV Smart Charging Pilot, the team set a lower threshold called the Virtual Transformer Capacity Constraint and determined the EV Charging Capacity by subtracting the value of the Residential Load Profile from the Virtual Transformer Capacity

Constraint at each point in time over the 24-hour period. The constrained capacity limit increased the likelihood the Optiwatt app had to manage the charging of the connected vehicles to remain below the limit and provided a good test of the app's capabilities.

Phase 2 also included six demand response events. Participants in the Managed Charging group and the TOU group were asked to stop their charging during a simulated time of high electricity demand and were given an incentive for participating. To test the difference in customer participation between opt-in demand response events and opt-out demand response events, TOU participants were given the option to opt-in by clicking a button, while Managed Charging participants were automatically enroled and given the option to opt-out of the demand response events by clicking a button. The participation rates were assessed and compared between the groups.

Phase 3: All Managed Charging

January to June, 2024

Phase 3 was designed by the team to better understand participants' willingness to join a managed charging program. Pilot participants were offered a randomly assigned one-time incentive to join the managed charging program. If they chose not to have their vehicle charging managed by the Optiwatt app, they had the option to stop participating in the Pilot altogether. The same $0.035/kWh charging incentive from Phase 2 was also used in Phase 3. Phase 3 followed all participants who chose Managed Charging, with the Optiwatt algorithm managing EV charging based on the settings they had entered into the Optiwatt app. Phase 3 provided further insights to understand what factors influenced customers to choose managed charging.

RESULTS

EV Charging Results

The Pilot results indicate that participants in both the TOU and Managed Charging groups were willing to adjust their EV charging behaviour, resulting in reduced EV charging during daily peak hours and, by extension, reduced stress on the grid. However, the TOU group results showed that EV charging dramatically ramped up at the beginning of the incentive window and caused a new localized peak demand. In contrast, participants in the Managed Charging group had their charging managed such that collectively, their charging stayed under the virtual transformer limit while still ensuring EVs were charged as needed. This resulted in reduced charging peaks across every hour of the day. The differences in these charging patterns are highlighted in Figure 5 which shows the number of times charging went above the Virtual Transformer Capacity Constraint.

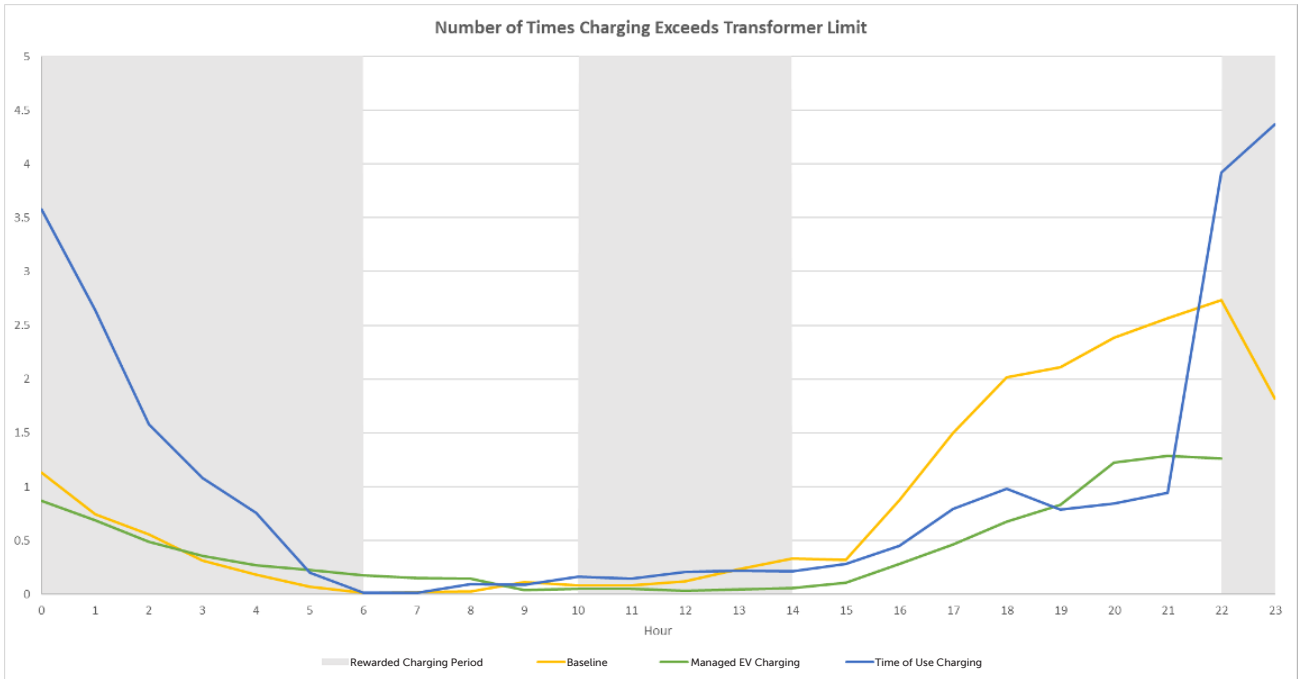


Figure 5 Charging Results

Demand Response Results

Six demand response events were simulated in Phase 2. These events were communicated to participants using notifications in the Optiwatt app. Participants in the Managed Charging group had the opportunity to opt-out of an event by clicking a button (i.e. They had to click a button to continue charging during the event) while participants in the TOU group had the opportunity to opt-in to an event (they had to click a button to stop charging their vehicle). Participants received $4 per demand response event. Participation in the demand response events for the opt-in group was consistently around 9 per cent while participation for the opt-out group was consistently around 97 per cent, shown in Figure 6 below. These participation rates suggest that making participation in demand response automatic will lead to higher participation rates than one that asks participants to take action (i.e. click a button to stop charging).

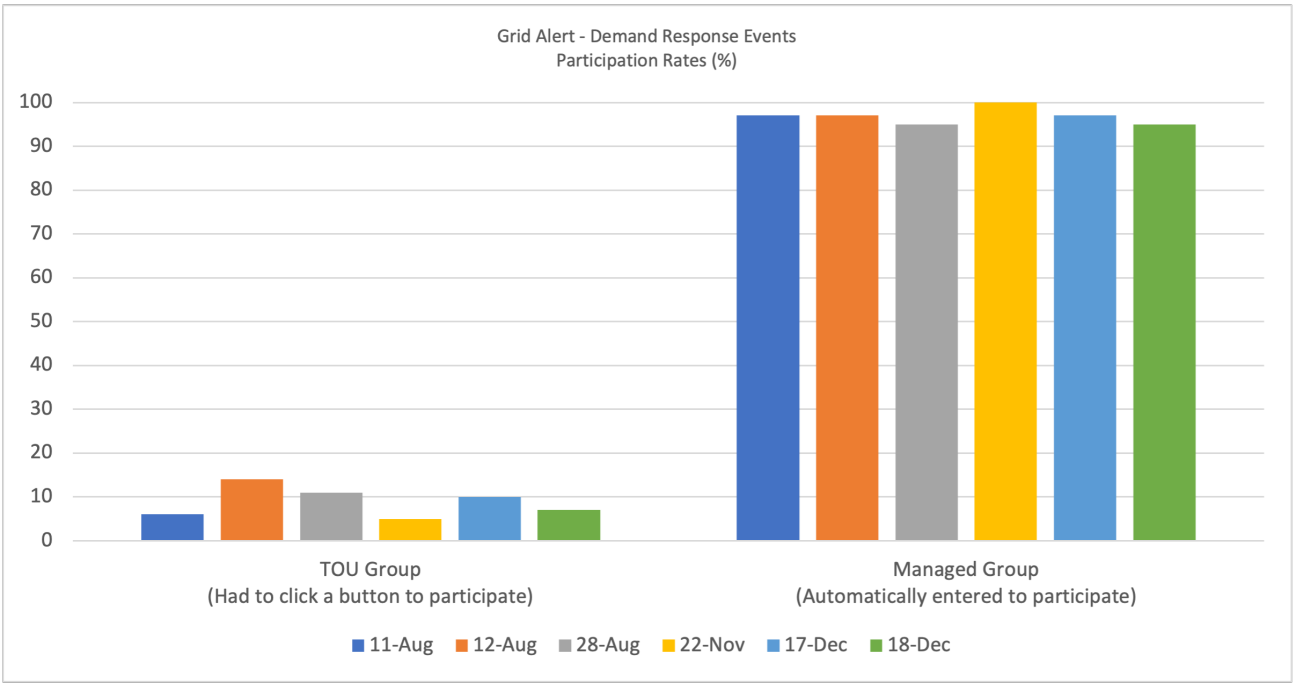


Figure 6 2023 Demand Response Event Participation

Participant Satisfaction Results

Participant surveys were sent at the end of each phase and included a question on overall Pilot satisfaction. Over the three surveys, participants reported an overall satisfaction rate of four out of five stars.

Additionally, as mentioned earlier, participants in the Managed Charging group were able to opt-out of individual managed charging sessions if they wanted their vehicles to start charging immediately when their EV was plugged in. Of the more than 5000 managed charging events, participants only opted out of 44 charging sessions, concluding that participants were willing to rely on Optiwatt's algorithm to achieve the desired level of charging for their EVs by the time they needed their vehicle.

FINDINGS

The Pilot results indicate that TOU rates were effective at shifting EV charging outside of traditional peak times, but in so doing, they have the potential to create a new EV charging-driven peak at the outset of the incentive time block. This outcome has the potential to drive system upgrades the TOU rates are intended to avoid or defer. On that basis, TOU rates should be paired with other DSM programs to reduce the new demand peak that can be created at the start of the incentive window.

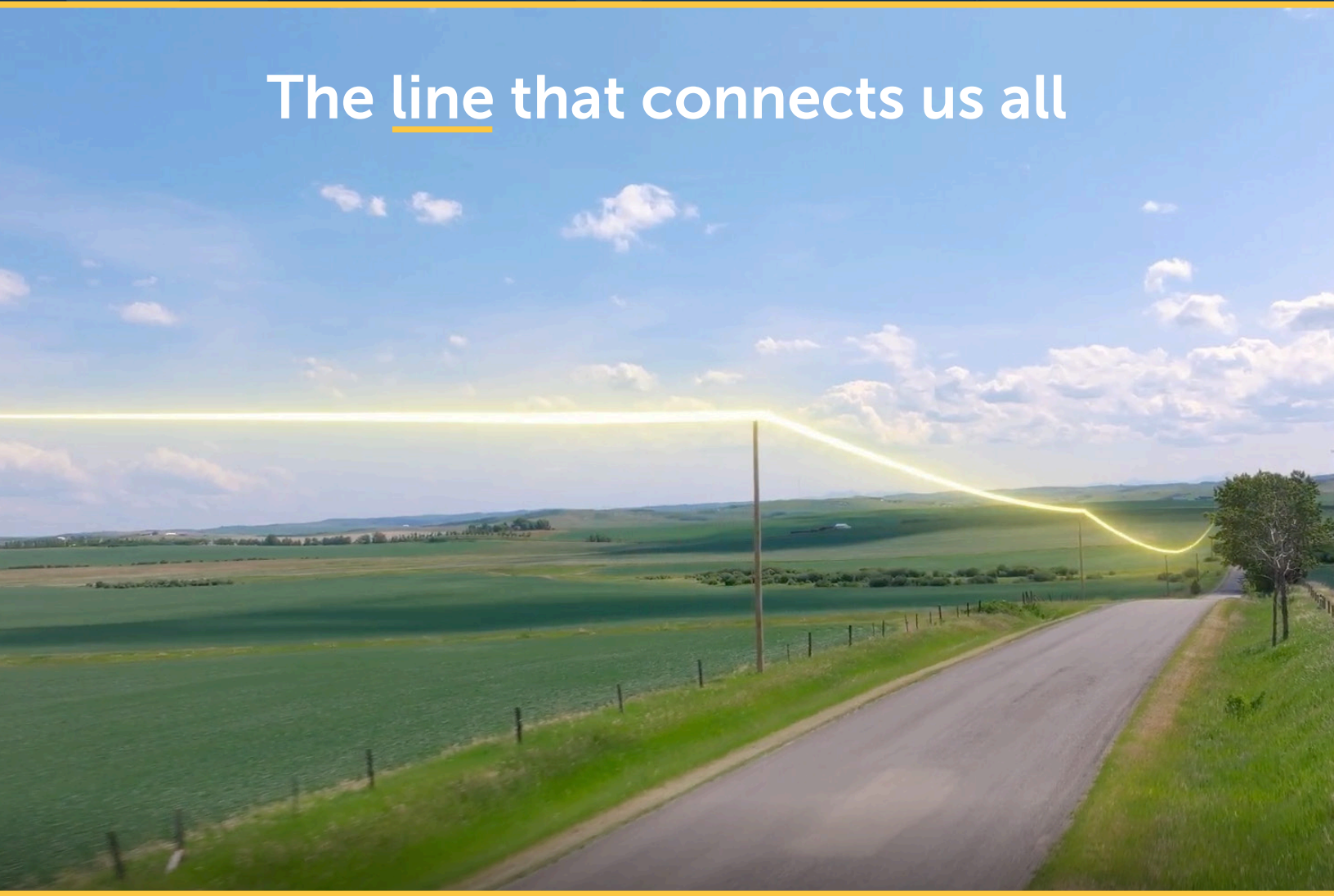
FortisAlberta found that managed charging was an effective way to automatically reduce EV charging peaks while meeting participant's EV charging requirements. The use of managed charging has the potential to help reduce the need for infrastructure capacity upgrades and costs through optimization of the existing grid and active charging management. The results of the Pilot also indicate that customers were willing to participate in demand response events and were more willing to participate when they were automatically enroled.

NEXT STEPS

FortisAlberta is using the findings from the Pilot to inform policymakers about DSM program opportunities in Alberta. Currently, Alberta is one of the only jurisdictions across North America without DSM programs enabled through the utility system or offered by a government entity. One of the DSM programs that FortisAlberta is evaluating is a long-term managed charging program. This evaluation looks at leading indicators including Alberta's EV registration rates and EV adoption projections to determine when a managed charging program will be more cost effective than traditional options to increase grid capacity.

FORTIS ALBERTA

The line that connects us all



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