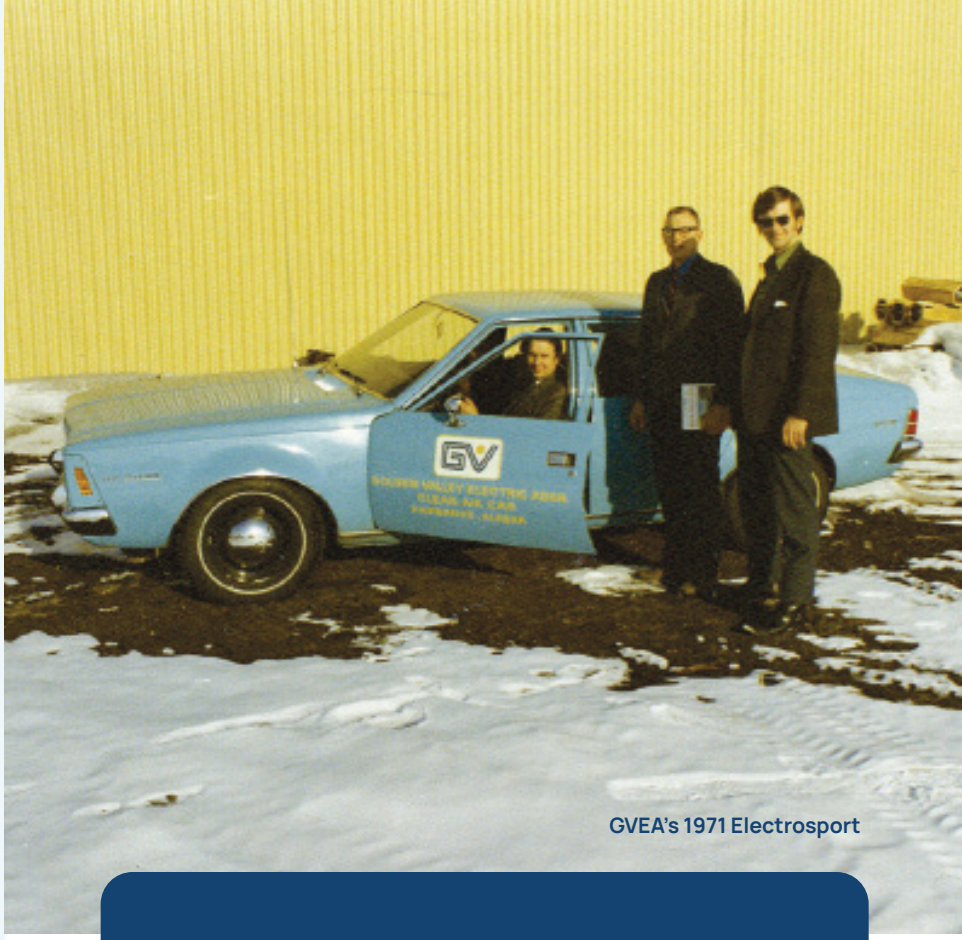
An Alaskan EV charging network 50 years in the making

The electric vehicle (EV) market is booming. For example, during the 2018 Super Bowl, exactly zero ads aired for EVs. However, in 2022, seven of the nine automobile ads during the Super Bowl promoted EVs, including one for BMW featuring Arnold Schwarzenegger and Salma Hayek.

Ad spending for EVs during the notoriously pricey Super Bowl reflects the growing interest in vehicles powered by electrons. According to Gartner's market research firm, 6 million EVs will ship out in 2022. A survey late last year found that the average estimate among auto executives suggests EVs will constitute over 50% of their new vehicle sales by 2030.

While utilities, policymakers, consumers and automakers appear to embrace EVs in the coming years, one utility has been thinking hard about EVs for more than five decades. In 1971, Fairbanks, Alaska-based Golden Valley Electric Association (GVEA) purchased one of just three electric-powered Electrosports. The light blue car cost just over $10,000 and included 20 lead-cobalt batteries weighing 1,500 pounds. This purchase was the first step in GVEA's EV journey. They took a second big step when the utility worked with the leading North American EV charging station manufacturer and network operator, FLO, to install two new DC fast chargers.



GVEA's 1971 Electrosport

The average estimate among auto executives suggests EVs will constitute over 50% of their new vehicle sales by 2030.

Exploring EVs as a way to address air pollution

50 years ago, GVEA purchased the futuristic Hornet because it wanted to test the vehicle to see if it could help reduce the ground-level pollution causing so-called "ice fog" in the region. "We get the inversion layer here, so anything burned stays within about 40 feet above the ground," said Evan McArthur, GVEA's energy efficiency engineer. "In other words, it doesn't go up and away, so we end up with poor air quality."

Hoping that EVs could lower tailpipe emissions contributing to ice fog, GVEA tested the Hornet extensively. While the car worked well in warmer temperatures, the consistently frigid temperatures common in Alaska resulted in problems.

> **"It was tested in the interior for a year. The battery didn't work well in our cold conditions. But there was also a commitment that while this one didn't work, we will keep working to promote this technology in the future."**
>
> **MEADOW BAILEY**, GVEA's director of external affairs and public relations

The right time to reexamine EVs

That time has arrived again, thanks mainly to the technology advancements and cost reductions responsible for making EVs an appealing choice to drivers around the globe. For GVEA, many reasons compel them to focus again on EVs, including their role in achieving the utility's goal to reduce carbon emissions by 26% by 2030, and improve Fairbanks' air quality issues related to PM. Like the case 50 years ago, GVEA remains interested in seeing how EVs can help tackle the continuing challenge of ice fog. Most importantly, GVEA maintains its commitment to respond to growing EV interest among the 36,000 members it serves.

For GVEA, many members wanted readily accessible charging infrastructure wherever they drive in the utility's service territory. "The first and foremost concern with our members is range anxiety," McArthur said. "We don't have a very dense charging network, and the cold weather here can reduce the range of an EV, so our chargers need to be closer than would be the case in the lower 48 [states]. We are very open to working with others to install chargers because we don't want to duplicate our expanding charging network efforts."

To that end, GVEA worked with FLO, to install two 50 kW DC fast chargers at the utility's Fairbanks headquarters last November. The chargers now serve as the northernmost public EV chargers operating in North America.[1]

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1. At the time of writing and according to the US Department of Energy's Alternative Fuels Data Center. https://afdc.energy.gov/fuels/electricity_locations.html#/find/nearest?fuel=ELEC

Reliable chargers in extreme cold

The fact that extreme cold thwarted GVEA's initial test of EVs over half a century ago does not go unconsidered. As the GVEA examined potential charger suppliers, one of the main priorities was to find a vendor with experience operating successfully in temperatures as low as 40°F below zero. FLO's unique experience deploying chargers in the extreme cold, thanks to the company's vast charging network extending as far North as the Yukon made for a perfect match.

FLO's SmartDC™ fast chargers installed in Alaska have features to withstand operating temperatures ranging from minus 40°F to 122°F. For example, they feature a unique heating and hybrid cooling system to cater for locations prone to snowfall and where dust can build up. During the summer months, it uses a large surface for the air intake to minimize the flow speed and therefore the ingress of dust, minimizing the need to change the filters. The hot air is exhausted at the top of the charger, taking advantage of natural convection. During the winter months, a heat exchanger is used, so that there is no air intake from the outside of the charger, minimizing the risk of having the input filter blocked by snow.

In addition, an aluminum compartment protects the charger's network and power components. "FLO uses aluminum over other materials, such as plastic, because of its durability and corrosion resistance and its proven ability to withstand significant temperature variations, which can cause other material, such as plastic, to become brittle and break down over time," noted Michael Pelsoci, FLO's regional sales director.

FLO's SmartDC™ fast chargers installed in Alaska have features to withstand operating temperatures ranging from minus 40°F to 122°F.

Other design and component choices improve the resilience of FLO's fast chargers. For one, the commercial-grade charging cable remain flexible in the cold and the cable holsters are located on the sides of the station enclosure, where they are protected and sheltered from the weather, which can otherwise impact operation and uptime. This is especially important in cold climates where snow and freezing rain must be taken into consideration. FLO's SmartDC also features a simple and convenient user interface. The absence of a touchscreen means that you won't run into issues like lagging in freezing weather. "Using the FLO mobile app or their RFID card, EV drivers can easily start and pay for the charging session," Pelsoci said.

*The 50 kW SmartDC charger is shown here with optional cable management system and optional credit card reader.

Though critical, not all of the ingredients required for chargers to operate reliably result from smart design and component choices. Through its work operating its charging network in the Yukon, FLO has learned other important reliability lessons. Among them includes the need to establish relationships with local technicians able to perform maintenance quickly and the importance of having an easily accessible supply of spare parts in case of a component failure. Routine preventative maintenance proves particularly critical in cold climates, as well as having more than one charger at a charging station.

> **"It can be life-threatening to an EV driver stranded in freezing temperatures without access to a charger."**
>
> **MICHAEL PELSOCI,** FLO's regional sales director

FLO's experience in the Yukon provided another reason for GVEA to select the SmartDC fast chargers. Another important feature was that the chargers can charge EVs with both CCS and CHAdeMO ports and that FLO handles the operations and maintenance of the chargers and the payment processing. According to McArthur, FLO was also able to meet short turnaround times to deliver and install the chargers quickly.

Lessons learned and plans for the future

For GVEA's McArthur, installing the chargers provided a particularly instructive experience, offering knowledge that will help him guide members interested in installing their own EV chargers. "I feel like we are better equipped now because we know what's required," McArthur said. "So, if other people in our service area are installing chargers, we have worked through this internally, which will help us assist our members."

Since the chargers began operating in late November, they have already experienced exposure to the harsh conditions of an Alaska winter. McArthur says temperatures dipped 40 °F below zero for over a week, and drivers still charged their cars at the newly opened station. "We had someone come in and charge, and they said the only thing that was different was that it took longer for their car's battery to warm up," he said. "The battery has to warm up to the operating temperature before it can charge."

In the first 5 months of operation*:

Number of charging sessions:
556

Energy transferred:
23.5 MWh

Average session duration:
63.7 minutes

Uptime:
100%

*From November 2, 2021 to March 29, 2022

Since beginning operation, the number of charging sessions has been higher than GVEA expected, with many drivers leaving check-ins and positive reviews on PlugShare. Several EV manufacturers have also utilized the chargers to do cold-weather testing in January, February and March, contributing to those increases. What GVEA continues to learn through this deployment will also inform its ongoing efforts to roll out more charging stations.

> **"We plan to provide charging where there currently isn't any, and provide charging that links highways and connects communities. We are not offering subsidies for EV purchases, and we always keep in mind that we want to be equitable to all our members. But providing charging is a way to remove barriers to EV adoption."**
>
> **EVAN MCARTHUR,** GVEA's energy efficiency engineer

For its part, FLO can help provide GVEA data to inform future decisions about charging infrastructure. Because the charging stations connect to FLO's more extensive network, the company can continuously monitor charging activity and utilization throughout the region. "The data that FLO collects can help justify an investment in EV charging and provide a good indicator for expansion of EV charging services," Pelsoci explained. "As EV adoption grows, there will inevitably be a need to expand charging services across all road networks. We're looking forward to supporting GVEA in developing a robust EV charging ecosystem across Alaska."