SiLVERS

St. Louis Vehicle Electrification Rides for Seniors
Final Report

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Project EE0009218

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FORTH
Empowering Mobility

ABOUT FORTH

Forth's mission is to electrify transportation by bringing people together to create solutions that reduce pollution and barriers to access. Forth envisions a world where clean and equitable transportation systems move everyone and everything.

ACKNOWLEDGMENTS

The SiLVERS project was made possible by a series of outstanding project partners and collaborators.

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GM Climate Equity Fund

Ameren

North Newstead Association

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EXECUTIVE SUMMARY

The St. Louis Vehicle Electrification Rides for Seniors (SiLVERS) was a three-and-a-half year pilot project to increase EV adoption and reduce transportation-related operating expenses for social service agencies in low-income communities. This was achieved by introducing light-duty electric vehicles (EVs) and charging stations into the operations of two community-based organizations (CBOs) to provide rides and deliver meals for seniors within the St. Louis Area Agency on Aging's distribution network.

During the two years of service delivery, 3,306 rides and 109,140 meals were delivered with the project's five Chevrolet Bolts. The vehicles traveled over 130,000 miles and used nearly 40,000 kWh of energy, saving more than 63,000 pounds of CO2.

The drivers of these vehicles reported increased knowledge and interest in electric vehicles following the implementation of the program. This result highlights the importance of introducing EVs to communities without previous exposure to this technology.

A total cost of ownership (TCO) calculation utilizing data collected from two years of operations and extrapolated over 10 years revealed that when EVs are granted (a common way social service agencies fund vehicles), they are cheaper to own and operate than granted gas vehicles. When vehicles are purchased, the TCO for gas vehicles was calculated to be slightly cheaper than EVs. Both granted and purchased gas and EVs TCO are less expensive than the most common scenario: paying contractors to use their own personal vehicles.

Challenges and learnings over the course of the SiLVERS program included understanding the capabilities of new technology (vehicle range, size, charging speeds), user behavior and maintaining the functionality of the charging hardware and vehicles. Overall, the participating CBOs (Community-Based Organizations) perceived the introduction of EV technology as having a positive impact on their operations.

Over the course of the project, Forth and its partners created resources and distributed information at conferences and workshops nationally to spur similar initiatives. More information can be found in the "Resources" section of this report.

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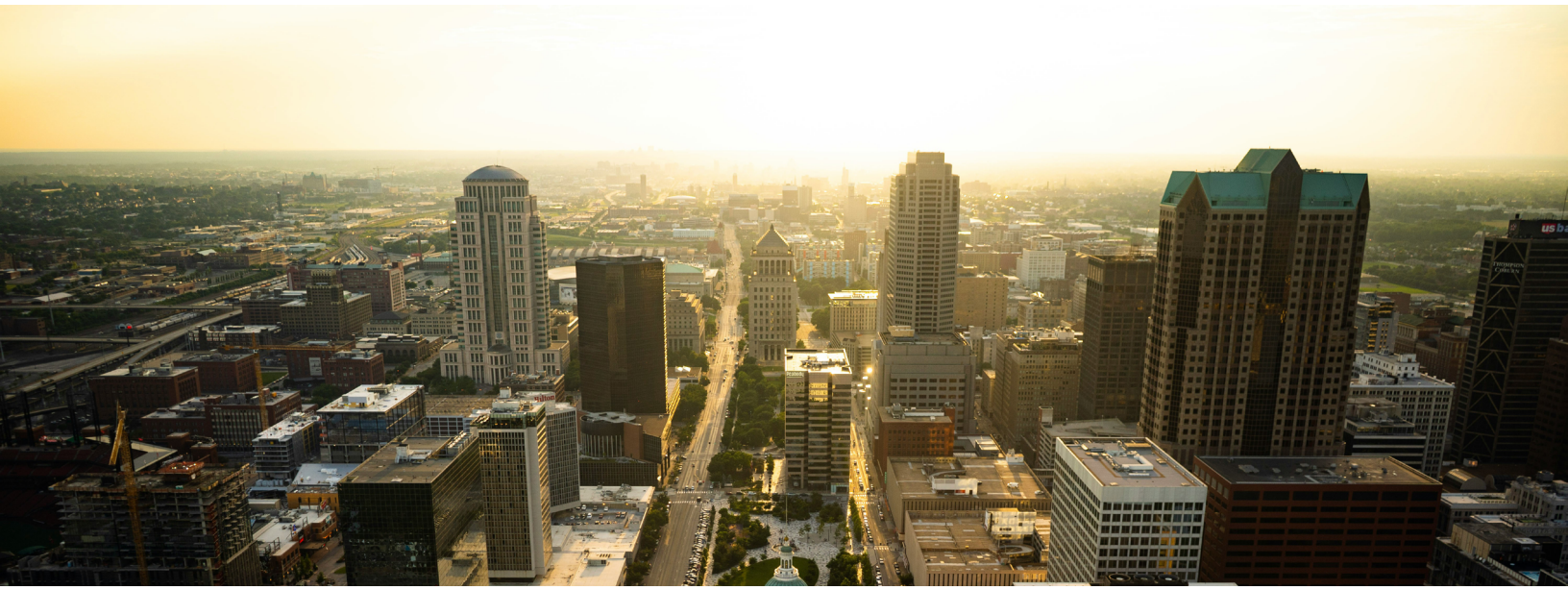
INTRO

St. Louis, Missouri, is a diverse Midwestern city that has experienced a half-century of population loss, going from 850,000 residents in 1950 to 300,000 today. This downturn has had other consequences, including falling behind when it comes to technological improvements in infrastructure and transportation. While access to EVs and charging infrastructure is growing quickly in many cities, it has thus far been limited in St. Louis, which has few local or state incentives for purchasing or leasing electric vehicles (EVs). In 2020, the entire state of Missouri had only about 6,700 registered EVs, whereas Oregon with roughly two million fewer inhabitants, had more than 36,000.



The goals of the St. Louis Vehicle Electrification Rides for Seniors (SiLVERS) project were to increase EV adoption and to reduce transportation-related operating expenses for social service agencies in low-income communities. The project sought to increase EV adoption by:

- Validating that EV fleets can save social service agencies money on transportation operation costs while improving service delivery
- Providing access to electric vehicle supply equipment (EVSE) for employees and community members
- Developing tools and best practices for use by CBOs and social service agencies nationwide, allowing them to replicate this approach

The project's approach addressed multiple existing conditions that required attention:

- Private chargers typically serving a single vehicle
- Limited fleet vehicle chargers at workplaces, often located behind fencing, without community access
- Low rates of EV adoption in St. Louis
- Lack of access or awareness of EVs and the benefits they can provide at CBOs in low-income neighborhood
- Limited access to experience new, cleaner technologies, such as EVs, within populations who do not drive and/or cannot afford their own private vehicles, including seniors

SiLVERS provided EVs and charging to two community centers, Northside Youth and Senior Service Center (Northside) and City Seniors, Inc. (CSI), in North and South St. Louis respectively. The EVs were used as part of their fleets to provide non-emergency rides to elders and distribute food to homebound seniors. SiLVERS sought to make the economic and environmental benefits of electric transportation available not only to the seniors served by Northside and CSI, but to other community members as well. The EVSE software platform enabled community members to access the chargers when not in use by the CBOs' fleet vehicles.

Creating a sustainable model for small CBOs to operate EVs as part of their fleets and host publicly accessible EVSE was an opportunity to decrease transportation emissions and increase EV adoption that had not been fully explored before the SiLVERS program.

The SiLVERS project team came together as a result of Forth's participation as a consulting organization for the Bloomberg American Cities Climate Challenge, in which St. Louis was a participating city. Partnerships developed through the Climate Challenge led to the submission of a grant application to the U.S. Department of Energy's (DOE) Vehicle Technology Office. SiLVERS was awarded, with 50% of funding from the DOE and the other 50% of support for the program coming from various other funding sources and in-kind contributions.

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METHODOLOGY AND IMPLEMENTATION

PROJECT DEVELOPMENT

SiLVERS was broken into three distinct phases or Budget Periods. The activities for each Budget Period are summarized below.

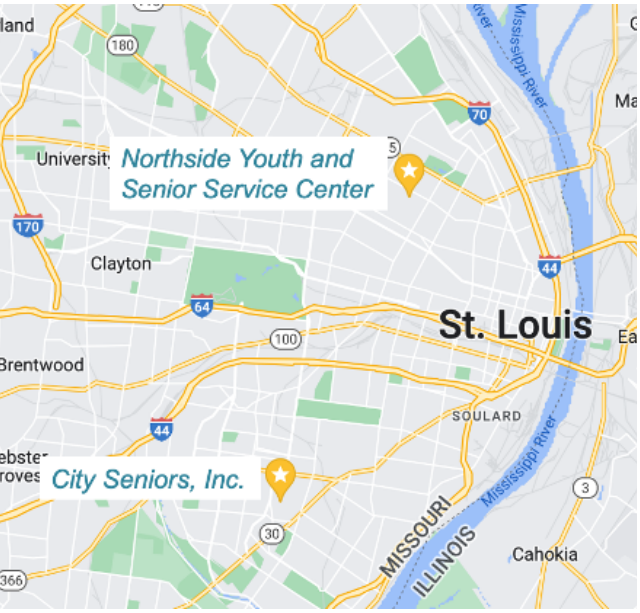
Budget Period 1

OCTOBER 1, 2020 - DECEMBER 31, 2021

The first Budget Period was used for project development and launch. First, Forth assembled the project partners. After developing a relationship with the City of St. Louis while participating in the Bloomberg American Cities Climate Challenge, Forth partnered with the St. Louis Area Agency on Aging (SLAAA), a government agency that provides funding to private CBOs that serve the St. Louis elderly population. Forth and SLAAA selected Northside Youth and Senior Service Center (Northside) and City Seniors, Inc. (CSI) as participating CBOs because both organizations served traditionally low-income populations, and geographically represented both North and South St. Louis. Further, North St. Louis, where Northside is located, has a majority of Black residents. Ensuring members of the BIPOC community were included was of crucial importance to the project.

Partner Type	Organization	Role
Sub-recipient	North Newstead Association	Community outreach and support
	St. Louis Area Agency on Aging	Coordination with community partners, utilization, data tracking
	St. Louis Regional Clean Cities Coalition	Information dissemination, Clean Cities Coalition collaboration
Industry partners	General Motors	Project funding, via their Climate Equity Fund
	AmpUp	Charger software, data collection and synthesis
	Ameren	Charger rebates, in-kind support
Community partners	Northside Youth and Senior Service Center	Host Sites and service delivery
	City Seniors, Inc.	

Chart of SiLVERS project partners and their roles



Three vehicles and three dual port charging stations were placed at Northside, and two vehicles and two dual port charging stations were placed at CSI. Forth selected the EV charging network AmpUp for its ability to both provide charging station data and integrate directly with on-board vehicle telematics to gather vehicle data. AmpUp provided level-2 charging stations from vendor EV Box.

Forth, via a Request for Proposals, identified a local electrician to perform the charging station installation. Ameren provided a rebate that covered the majority of installation costs through its "Charge Ahead" rebate program.

Forth performed a fleet requirements identification and a transportation assessment to select vehicles for the project. Given constraints at the time, Chevrolet Bolts (leased) were selected as project vehicles.

To prepare the vehicles for the program, decals were added, seat covers were installed and for CSI, radios were installed in the vehicles for phone-free communications with dispatch capabilities.

A ribbon-cutting launch event was held in September 2021. Attendees included team members from CSI, Northside, Forth, elected officials and staff from the City of St. Louis and State of Missouri, representatives from Ameren (the local electric utility and a project partner) and other stakeholders. North Newstead Association, another local community-based organization, developed promotional materials, such as brochures and keychains to be handed out at this and following events.

Vehicles and charging stations became operational in November 2021. Forth and project partners began collecting data at this time.

Left: SiLVERS Ribbon Cutting, September 2021

Budget Period 2

JANUARY 1, 2022 – DECEMBER 31, 2022

In the second Budget Period, the project focused on supporting Northside and CSI as they began to utilize the EVs for service delivery, measuring impact, disseminating project design and results, and developing tools for replication of the project.

After the charging infrastructure was installed and the EVs were delivered, Northside and CSI smoothly integrated the EVs into their respective fleets. The EVs replaced ICE vehicles owned by the CBOs or by volunteers that had previously been used to deliver meals and provide rides to seniors.

Forth continued to host quarterly and monthly meetings with project partners. In May, Forth staff visited St. Louis and collaborated with Northside, CSI, SLAAA and North Newstead Association to host an event for Older Americans Month. This event, held at CSI, had several objectives: (1) raise awareness that CBOs were utilizing EVs to meet their transportation needs; (2) conduct test rides with local seniors; and (3) showcase the program to other local CBOs.

During this period, Forth released a series of publicly available **tools and resources**, and shared information on SiLVERS at conferences, webinars and workshops, including two major conferences: the Forth Roadmap Conference in Portland, Oregon and EVS35 (the International Electric Vehicle Symposium) in Oslo, Norway. St. Louis Clean Cities Coalition, a project sub-recipient, also disseminated information about the project at Air Quality Advisory Committee meetings, monthly regional calls, car club meetings and conferences.

"This is a great program and we're excited for a possible 'SiLVERS V2' where hopefully we can find funding to expand the capacity of the program so more seniors can take rides. Thank you for the partnership!"

- CBO Staff Member

"It has made me consider my next vehicle purchase being an EV."

- CBO Staff Member

Above: Forth Roadmap Conference

Budget Period 3

JANUARY 1, 2023 – MARCH 31, 2024

"Passengers have enjoyed the quiet, smooth rides that the EVs provide. The drivers enjoy not having to go to the gas stations as often when they're able to use the EVs."

- CBO Staff Member

"I like – no – I love the electric vehicle. It's smooth."

- CBO Client

In the third budget period, the project team continued many aspects of Budget Period 2, including regular partner meetings, data collection, information dissemination and primary service delivery (meals and rides).

Project staff presented at several more conferences and workshops, ranging from transportation (e.g. Green Transportation Summit and Expo, in Tacoma, WA) to social services (Show Me Summit on Aging and Health, in Columbia, MO). Forth provided technical assistance via calls and virtual meetings with organizations interested in the SiLVERS project. Additional exploration on how to replicate or scale the SiLVERS program was also conducted, including establishing the SiLVERS Clean Cities Coalition Working Group.

In September 2023, SiLVERS was featured on the Public Broadcasting Service (PBS) program MotorWeek, an award-winning automotive-focused television program broadcast to hundreds of stations across the U.S. with 429,000 direct subscribers.

Forth also worked with SLAAA and AmpUp to collect and analyze project data (see the "Results" section below).

The third budget period culminated with the handoff of charging station management from Forth to the CBOs and the production of this final report.

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RESULTS

ORIGINAL IDENTIFIED PROJECT OBJECTIVES AND STATUS

The table below summarizes the identified criteria of the project's "Statement of Project Objectives" compared to the actual outcomes. Please refer to the Quantitative and Qualitative subsections for a more detailed description of project outputs and outcomes. The Learnings section also details specific elements which contributed to the success of these objectives.

Stated Project Objective	Actual Project Outcome
1) Measure the extent to which EV fleets can save money and improve service delivery for CBOs or social service agencies.	Measured via surveys among staff and drivers, small EVs could meet a vast majority of service-delivery use cases and were received favorably. Quantitatively, the project showed EVs to be a cheaper option than gas vehicles when vehicles are granted, or compared to paying a per-mile reimbursement.
2) Create a model for deploying EVSE that can serve CBO or agency fleets and can also serve CBO or agency employees and other community members.	The SiLVERS model was created and implemented. However, there was a lack of utilization of these chargers among the employees and the general community. There are several variables expected to have impacted this.
3) Show that pilots like this can accelerate regional EV adoption.	EVs in Missouri increased from 6,700 in 2020 to 17,900 in 2022[1]. However, community-specific information on EV adoption was not available. Qualitatively, SiLVERS has increased interest in EVs among fleet drivers at these CBOs.
4) Create tools and best practices so this model can be replicated by CBOs and agencies nationwide.	Forth created a series of resources (available on its website) and has disseminated learnings through conferences, papers and media coverage.

1) "Electric Vehicles Registered in 2020." *Alternative Fuels Data Center*: TransAtlas, U.S. Department of Energy, afdc.energy.gov/transatlas/#/?year=2020. Accessed 21 Mar. 2024.

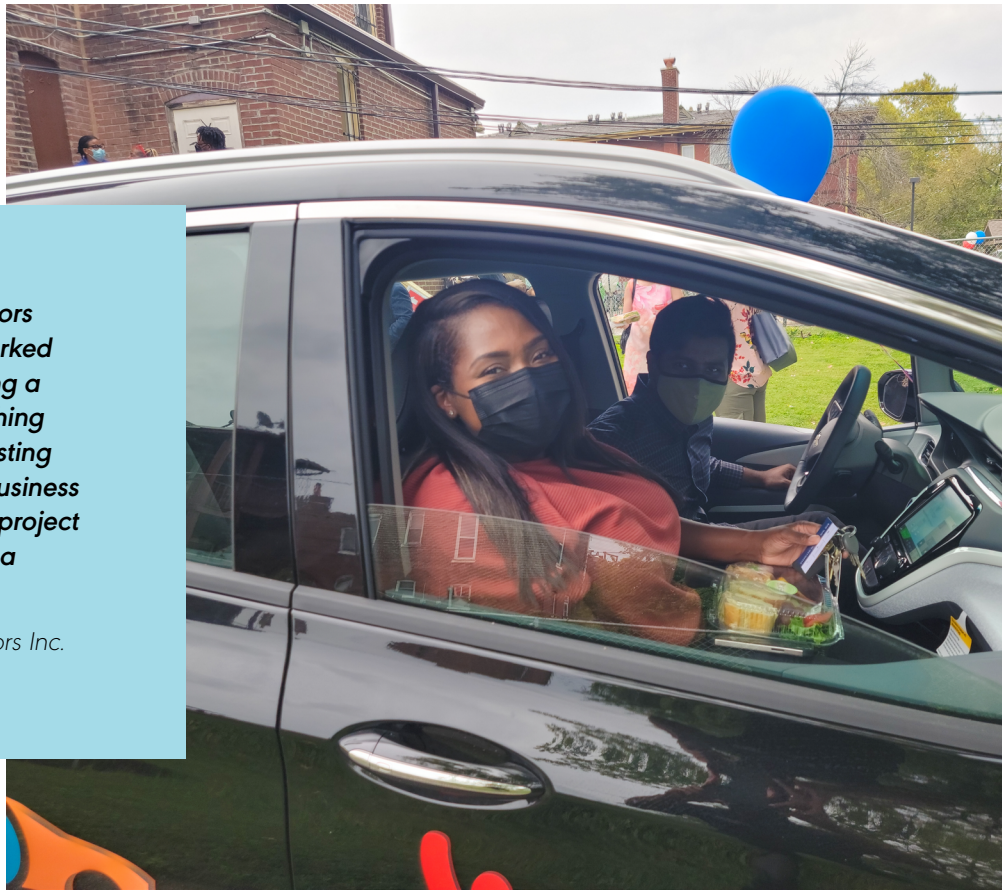
QUANTITATIVE RESULTS

Quantitative data has been gathered through three primary sources:

1) Meal and Ride Data

Meal and ride data was provided by the St. Louis Area Agency on Aging. Throughout the project's two-year implementation period, the two CBOs delivered nearly 110,000 meals with the project EVs. Meals are most commonly delivered in boxes of four to each residence. Over the same period, more than 3,300 rides were provided to community members. The demographics of individuals who utilized the SiLVERS service during the project duration are below:

- 40% of rides provided were provided to persons aged 65-74 (the highest percentage of clients served)
- 75% of clients served were female
- 52% of clients served were African American.
- The average SiLVERS client served was a low-income African American woman in the 65-74 age range living in North St. Louis.



"The Forth EV project opened City Seniors up to the world of EV technology. It sparked excitement into the organization, adding a sense of pride in being a part of something we had not imagined – It was an interesting process learning how all the different business sectors intertwined, connecting us to a project that City Seniors has been proud to be a part of."

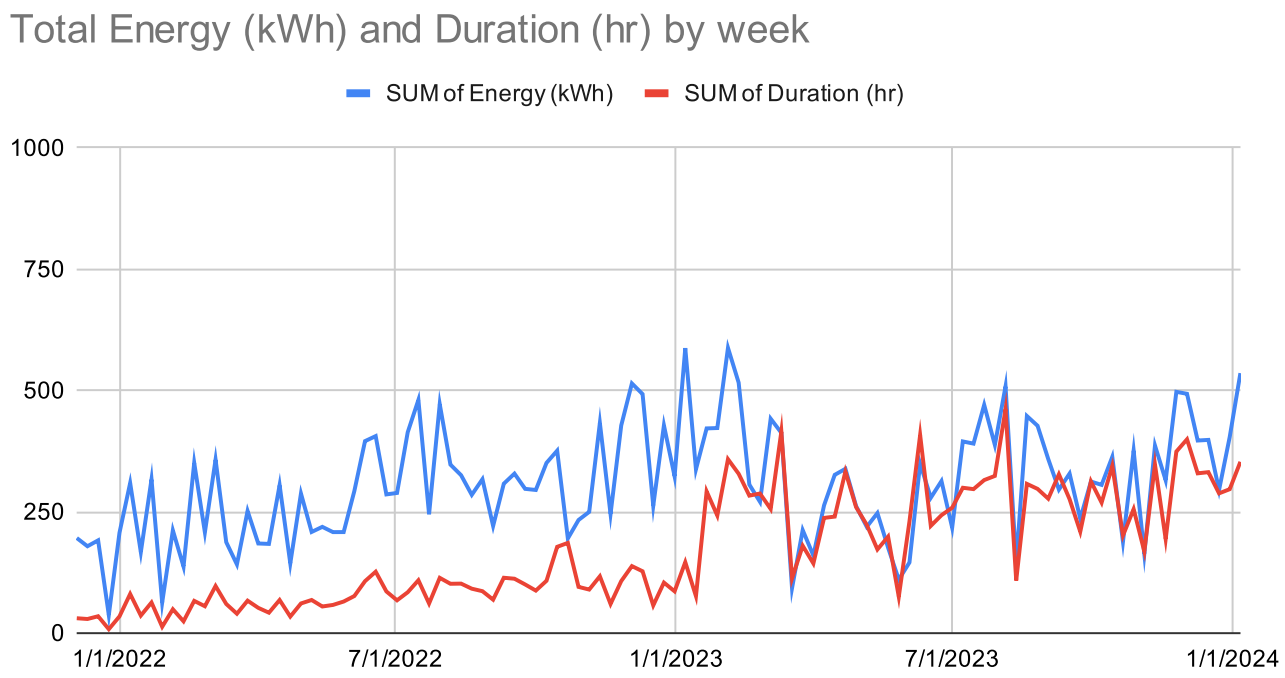
- Jennifer Bess, Executive Director, City Seniors Inc.

2) Charging and Vehicle Data

AmpUp provided charging and vehicle data from either the charger or the on-board vehicle telematics. The five project vehicles, averaging around 13,000 miles traveled annually, utilized nearly 40,000 kWh of energy. The estimated cost of electricity to conduct this service was roughly $3,500 and is estimated to have saved over 63,000 lbs of CO2 according to AmpUp's dashboard calculations.

Metrics	Total *(All 5 Vehicles) November 2021 - December 2023)*
Number of Meals Delivered	109,140
Number of Rides Provided	3,306
Number of Active Days (Vehicle)	349 (66.5%)
Number of Active Days (Station)	505 (66.9%)
Average Battery % at Start of Day per Active Day	79.0
Average Miles Traveled per Active Day	94.1
Median Miles Traveled per Active Day	54.4
Total Miles Traveled	131,987.1
Total Number of Charging Sessions	1852
Total Charging Energy (kWh)	39,604.4
Total Charging Duration (hr)	22,123.7
Charging Station Utilization	24.1%
Total Charging Cost	$3,463.37
Total CO2 Saved (lbs)	63,367.02

SiLVERS Project Tracked Data Summary



Energy Dispersed and Time Spent by Project Charging Stations Overt Project Period

3) Total Cost of Ownership Calculations (TCO)

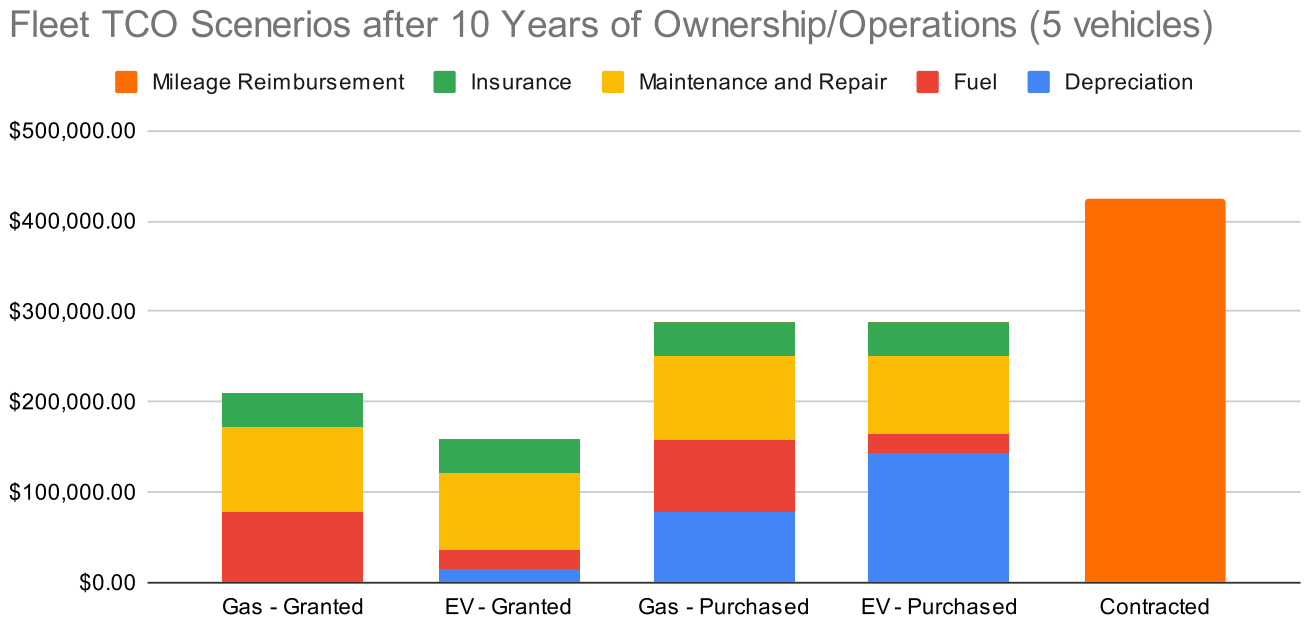
TCO calculations were completed by Forth using the Department of Energy's AFLEET tool. Three comparative scenarios were examined for the five-vehicle fleet over a 10-year service period. Chevrolet Bolts and Chevrolet Trax were used as the baseline vehicles in each for the EV and gas comparisons, respectively.

In the most common CBO model, CBOs do not own vehicles and instead contractors are paid a 65.5 cents per mile reimbursement for use of personal vehicles. This was the most expensive option for CBOs over the period, costing roughly $425,000. As a flat rate reimbursement, the financial implications are the same for gas or EVs.

The second most common model is for vehicles to be awarded through grants. In this scenario, the cost of operations for EVs was roughly $167,000, compared to $211,000 for their gas counterparts. Fuel cost is by far the most significant source of savings for EVs, though there is a small depreciation expense for the charging station hardware.

The third scenario compares purchasing the vehicles outright, without grants or rebates. In this scenario, purchased gas vehicles came out minimally on top ($290,000 versus $296,000). While EVs saved costs by not using fuel, the added depreciation of the EVs and charging infrastructure significantly increased overall costs for EVs.

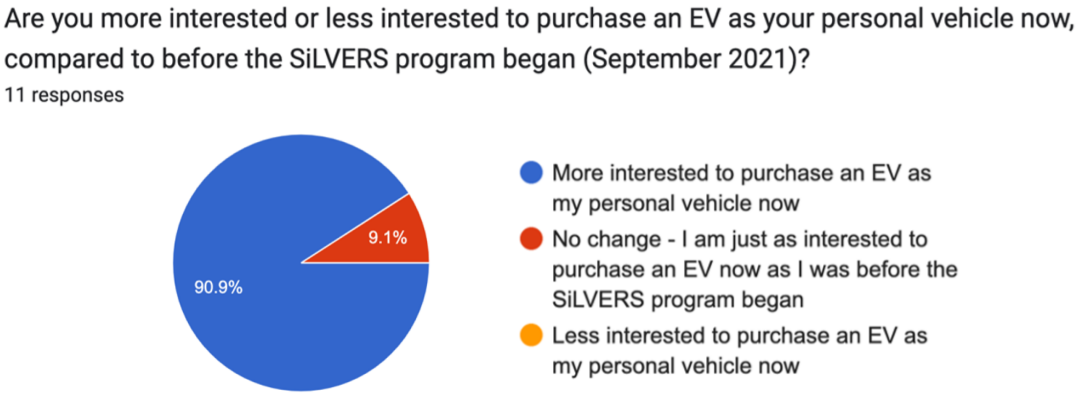
It should be noted that the external costs associated with emissions from gas vehicles are not included in these totals.



TCO Calculations for Three Fleet Scenarios: Granted, Purchased, Contracted

QUALITATIVE RESULTS

Forth collected qualitative data through survey interviews with vehicle drivers. As the operations of the two CBOs are relatively small, the corresponding number of survey responses from drivers was also small (n=11). In summary, survey results showed increased knowledge about and interest in electric vehicles. Program vehicles (Chevy Bolts) were observed to meet most program needs in terms of meal delivery and rides for seniors. Selected survey responses are below.



Change in driver interest in their own EV purchase, after program implementation

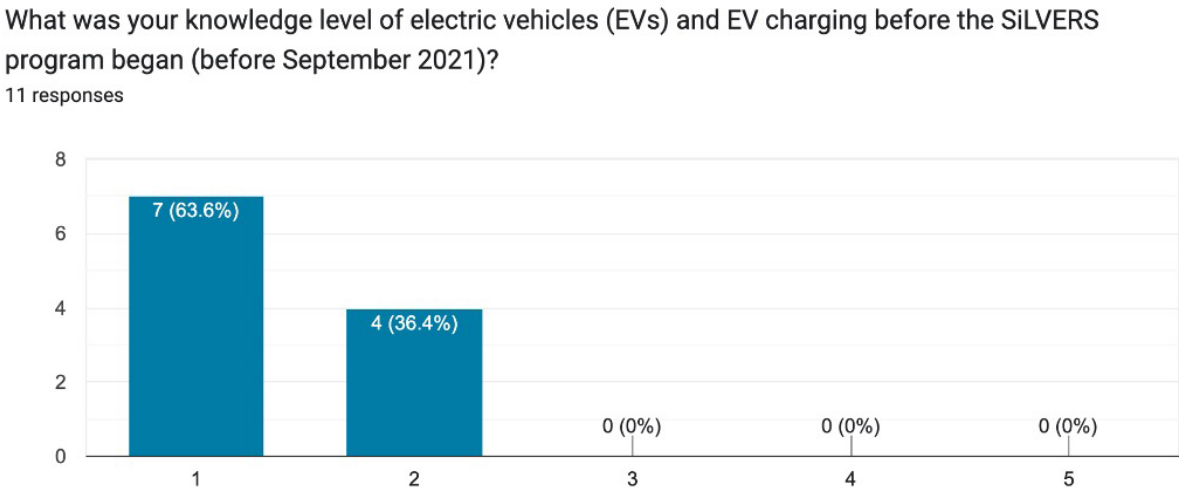


Chart of driver EV knowledge before program vehicle utilization

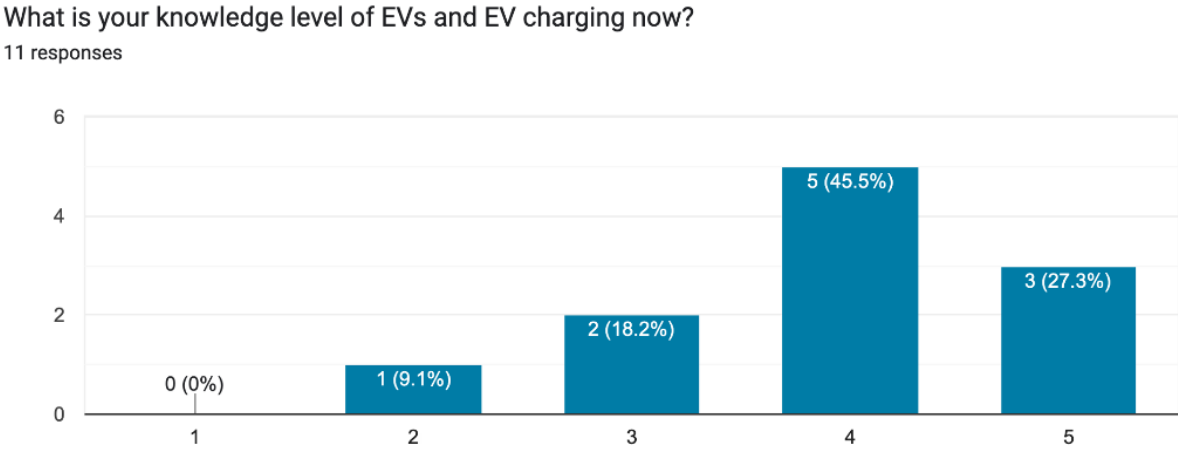
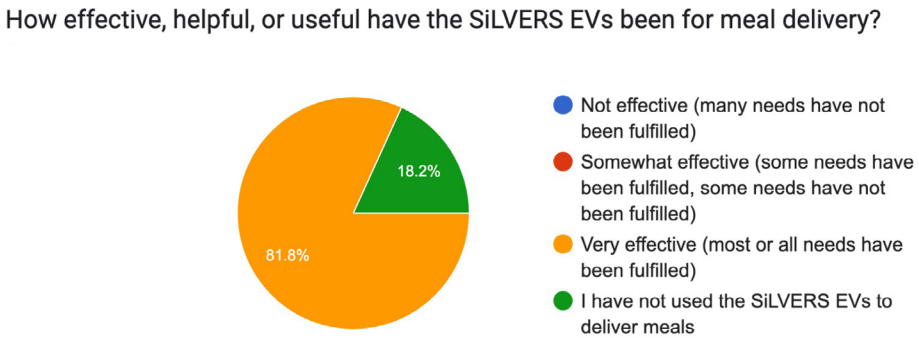


Chart of driver EV knowledge after program vehicle utilization



Driver Survey Responses on Usefulness of Project Vehicles: Meal Delivery

05

BUDGET SUMMARY

SUMMARY OF TOTAL PROJECT BUDGET

Total Project Funding	Dept. Of Energy Share	Non-Dept. Of Energy Share
$1,032,392	$500,000	$532,392

Original Project Budget

STATEMENT OF ACTIVITY: OCTOBER 2020 - MARCH 2024

Income		Expenses	
Foundation Grants	$112,547	**Personnel**	$149,333
Government Grants	$495,924	**Contract Labor**	$208,979
Miscellaneous Revenues	$40,118	**Marketing Expenses**	$599
		Travel	$11,984
		Program Event Expenses	$3,730
		Supplies & Misc. Expenses	$6,584
		Equipment Rentals	$67,331
		Repairs & Maintenance	$7,154
		Insurance Expenses	$34,485
		Indirect Expenses	$97,749
		Admin Allocation	$49,818
Subrecipient Cost Share	**$413,408**	**Subrecipient Cost Share**	**$413,408**
Total Expenses	**$1,061, 997**	**Total Expenses**	**$1,054,618**

Income, Expenses, and In-kind Contributions

Project funds were used for a variety of expenses, including leasing the project vehicles, vehicle repairs, maintenance and registrations, purchasing and installing EV charging stations, software, Forth and subcontractor personnel time, reimbursement to CBOs for service delivery (rides and meals), travel expenses to St. Louis and various workshops and conferences around the country and other miscellaneous expenses. A Statement of Project Activities is provided on the previous page. All budget categories, excluding "Subrecipient Cost Share" are included in Forth's Statement of Project Activities. Since subrecipients and partners maintain their own budgets, their in-kind contriubtions are identified as "Subrecipient Cost Share".

06

LEARNINGS AND OBSERVATIONS

CHARGING

When navigating the charging installation process, there was a delay in the installation due to a necessary transformer upgrade. It took several months for Ameren to replace this. Following installation, the EV Box stations had issues that did not allow them to discharge energy. Solving this issue required troubleshooting with the three parties sharing the responsibility: the hardware vendor, the software provider and the electrician. The dispersal of responsibility led to delays in finding a solution. (It turned out the hardware was internally tuned to a European standard and needed to be reconfigured before functioning properly.)

Throughout the project operation, chargers periodically needed a hard reset from the breaker. Host sites should expect to do this from time to time. This sort of hard reset could be cumbersome for an unsuspecting site manager. Several other issues that prevented the chargers from operating correctly were solved via software updates, but it often took time to identify and implement a successful solution. Occasionally, chargers would continue to exhibit functionality issues.

As of writing this report, two of the chargers were not working, with a solution still needed. Overall, charging infrastructure reliability and durability needs to be enhanced for an easier management experience.

On the project planning side, the original intention was for fleet chargers to also be used as public chargers. However, during the two years of availability, only three public users accessed the charging stations. The lack of use for public charging could be due to several reasons:

> ***"It was a real smooth ride, just clean, flows along...We can tell the difference from a regular car than an electric car... nice ride."***
>
> *- CBO Client*

(1) the chargers were located in parking lots behind buildings with limited visibility; (2) to limit vandalism, parking lot gates were locked outside of business hours; and (3) there were few EVs in the neighborhoods where the chargers were located (and to some extent, St. Louis as a whole).

VEHICLES

When Forth went through the vehicle selection process in 2020, the market still held a relatively small number of EVs compared to today. Given budget constraints and vehicle availability, Forth settled on Chevrolet Bolts for project vehicles. While small vehicles, they were still able to meet most of the program and the CBO's service needs.

A Northside volunteer loads a Chevy Bolt full of meals to deliver to local Seniors.

However, there were a few use cases the vehicles could not achieve, especially during peak periods of the COVID pandemic. The small vehicles made it difficult to drive more than one passenger at a time while maintaining adequate space between passengers for COVID precautions. A larger vehicle option (such as a small electric passenger van) for trips with several individuals would have been a good addition to the fleet. The small size also meant the vehicles were not ADA-accessible, and getting in and out for some riders was challenging.

The addition of the EVs changed the primary service delivery model from using personal staff vehicles to utilizing ones provided by the organization.

CSI reported they were able to get through the pandemic (and supply chain shutdowns) because of the vehicles provided through SiLVERS, while they were unable to get new vehicles from other grant sources. Northside reported there was less time and money spent on maintenance and fuel.

The Chevrolet Bolts received a series of recalls during the project duration, both for the battery pack and for seat belts. This required vehicles to be taken into the dealerships for service on multiple occasions. While awaiting a battery change, the vehicle range had to be limited to 80%. When this was paired with inclement winter weather, there were times when the available range created barriers to service. Understanding the real-world range and change that happens in regions which experience vastly different seasonal weather plannings is also a relevant takeaway.

> ***"The EVs have been very useful and have saved on fuel costs."***
>
> *- CBO Staff Member*

SERVICE DELIVERY

While it was listed as a major benefit that the participating CBOs and SLAAA had an established program for delivering program services, there were a few challenges that arose. There needed to be more clarity about which community members could ride in the EVs. Since the EVs only represented a portion of the CBO fleets, it could not be guaranteed that any specific individual would get to ride in an EV, creating confusion among users and dispatchers. A more thoughtful approach could have been taken from the forefront to communicate the program to end users.

07

CONCLUSION

The information in this report and the other resources created as a result of the project can be used to expand EV access to more communities, including populations (such as seniors or low-income populations, as addressed directly by SiLVERS) that may lack access to private vehicles. Historically, these populations have been the last to benefit from new and cleaner technologies. Simultaneously, the organizations serving these populations often have the most limited resources.

The SILVERS project has shown that EVs can both meet the use-case needs of social service agencies and can save resources in doing so.

CSI and Northside both won independent grants to buy the project EVs to keep them in service indefinitely. A training session was held to transfer charging station management from Forth to the host sites in March 2024. Forth continues to look for opportunities to advance transportation electrification in communities and community-based organizations in St. Louis and beyond.

08

RESOURCES AND MEDIA

RESOURCES

SiLVERS Webpage

Accessible Electric Vehicle Carsharing Programs

Equitable Electric Mobility Playbook

MEDIA COVERAGE

USA Today: **Electric vehicles for everyone? Climate justice programs help people of color, low-income Americans get moving**

Forth Blog: **St Louis SiLVERS Launch Event**

St. Louis Mayor's Office Press Release: **City of St. Louis Launches SiLVERS Sustainable Electric Vehicle Shuttle Program for Seniors**

St. Louis Public Radio: **St. Louis' senior citizens can get rides to the store in electric cars**

Missouri Times: **St. Louis launches EV shuttle program for seniors**

AmpUp: **AmpUp Debuts New EV Fleet Charging Solution**