2021 DOE Vehicle Technologies Office Annual Merit Review Presentation

Electric First/Last Mile On-Demand Shuttle Service for Rural Communities in Central Texas

PI / Presenter: Elizabeth Munger
Lone Star Clean Fuels Alliance (LSCFA)

June 23, 2021

Low Speed Electric Vehicle (LSEV)

Project ID # TI115

Overview

LONE STAR CLEAN FUELS ALLIANCE
A DOE Clean Cities Coalition Serving Central Texas

Timeline

- Start: October 1, 2019
- End: January 31, 2023
- 33% complete

Budget

Total project funding

- DOE Share: $711,588
- NREL: $100,00
- Cost Share: $811,588

- Funding BP1: $243,523
- Funding BP2: $606,891

Barriers Addressed

- Limited understanding of LSEV potential in on-demand rural transit operations
- Identification of barriers to LSEV usage and best practices to support usage
- Limited qualitative data supporting LSEV in on-demand usage

Partners

- Project lead: LSCFA
- Capital Area Rural Transportation System (CARTS)
- Electric Cab of North America (eCab)
- Visit Bastrop, City of Bastrop, Bastrop Chamber of Commerce
- Wheels & Water

Any proposed future work is subject to change based on funding levels.

Project Objectives

LONE STAR CLEAN FUELS ALLIANCE
A DOE Clean Cities Coalition Serving Central Texas

Objectives	Barrier	VTO Goals
• Develop, demonstrate and refine affordable, accessible, sustainable & replaceable **LSEV first / last mile (FLM) shuttle applications**	• **Limited understanding** of LSEV potential in rural transit operations	• **Affordability** for business and consumers: lower initial cost & maintenance than traditional options
• **Collect data** for analysis, sharing and public dissemination	• Barriers to LSEV usage **and best practices** to support usage	• **Economic growth**: additional riders, fun/safe factor, introducing EVs
	• Limited **quantitative** data supporting LSEV usage	• **Reliability/resiliency:** diversity, hedge against fuel costs
	• Limited **qualitative** data supporting LSEV usage	• **National security**: fuel diversity, domestic fuel

Project Approach

LONE STAR CLEAN FUELS ALLIANCE
A DOE Clean Cities Coalition Serving Central Texas

Budget Period 1: Planning, Data Collection System Design, Paratransit LSEV	Budget Period 2: Data Collection, Demonstration, Analysis & Reporting	Budget 3: Data Collection & Analysis
Vehicles procured; data collection systems integrated & installed	eCabs continue in shuttle operation.	eCabs continue in shuttle operation.
Planning completed • Engagement with partners and community • Route planning completed and ready for implementation. • Vehicles deployed in designated areas	**Data collection and analysis** • Data flow maintained from each vehicle to data management system & Livewire data platform. • Collect data on the community and the riders, develop data visualizations	**Data collection and analysis** • Data flow maintained from each vehicle to data management system and Livewire data platform. • White paper will disseminate innovative research themes & factors impacting adoption rates.

Any proposed future work is subject to change based on funding levels.

Project Approach

LONE STAR CLEAN FUELS ALLIANCE
A DOE Clean Cities Coalition Serving Central Texas

Multiple data sources

Quantitative Data:

- GPS location, telematics
- Driver observation / query: age, gender, actual pickup & destination
- Realtime data feed to NREL hosted “Livewire” data platform

Qualitative Data:

- Behavioral data through community surveys, customer surveys, retail destination surveys
- Track additional technical issues, best practices for LSEVs

Information Sharing & Dissemination on LSEVs in FLM through:

- Quarterly discussions with NREL’s Rural Transit project cohort
- One-on-one discussions (ODOT, City of Kyle)
- Rural transit EV webinars (July 28, August 25)
- Updates to Central Texas communities

Milestones

LONE STAR CLEAN FUELS ALLIANCE
A DOE Clean Cities Coalition Serving Central Texas

BP 1 Milestones	Type	Description
Stakeholder Feedback Translated	Technical	City and transit data and feedback from stakeholders utilized / translated into service needs.
Outreach Completed	Technical	2 local / regional events held to create awareness and gain feedback from the communities
Route Design Completed	Technical	Completed community engagement and route designs
Vehicles Secured	Technical	Vehicles for project identified and secured.
Data Collection Systems	Technical	Data collection systems installed in the 3 vehicles. Show public acceptance & willingness to utilize LSEV for FLM.
Vehicle Deployment	Go / No Go Decision	Minimum of 3 vehicles equipped with data collection and sharing technology will be operating

Milestones

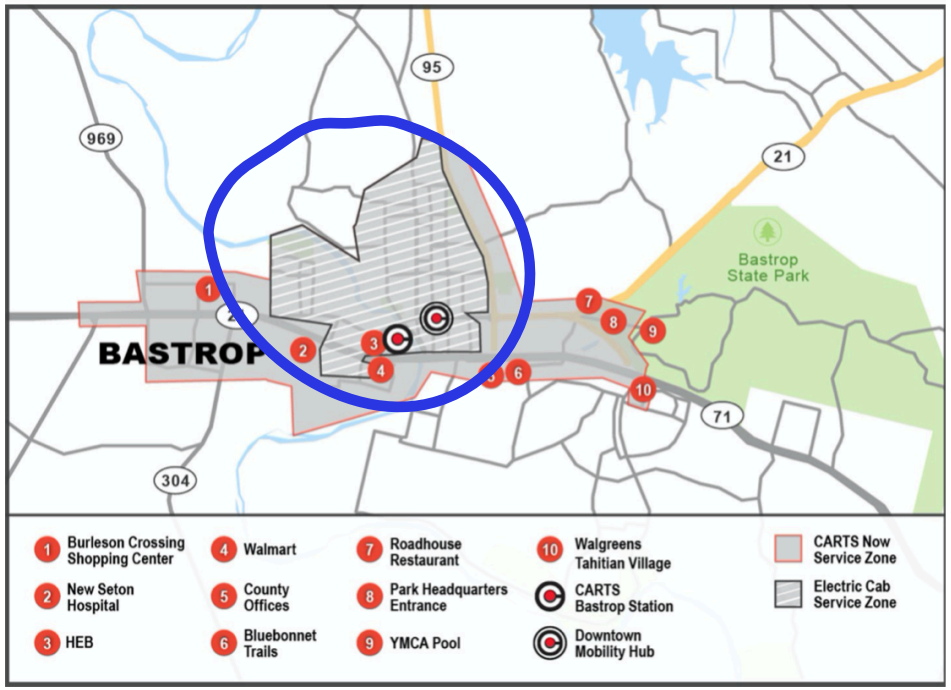
LONE STAR CLEAN FUELS ALLIANCE
A DOE Clean Cities Coalition Serving Central Texas

BP 2 Milestones	Type	Description
Pilot Shuttle Service Operational	Technical	Shuttle service operational for at least 10 months.
Community Engagement, Show & Ride events Complete	Technical	Community engagement events and approximately 2 Show and Ride events and survey information provided in a report
Traffic Evaluation Reduction Measurements Complete	Technical	Visual verification and traffic count in three participating neighborhoods complete.
Ridership and Vehicle Uptime goals reached	Go/No Go	Vehicles and system deployed in designated areas. At least 15% ridership levels with positive trend and 98% vehicle uptime. Report lessons learned and best practices. Other data assimilated and disseminated for community replication efforts.

Any proposed future work is subject to change based on funding levels.

Progress

LONE STAR CLEAN FUELS ALLIANCE
A DOE Clean Cities Coalition Serving Central Texas



Determine eCab zone (grey lines) within CARTS NOW response area

Integrate into CARTS NOW on-demand system.

Progress

LONE STAR CLEAN FUELS ALLIANCE
A DOE Clean Cities Coalition Serving Central Texas

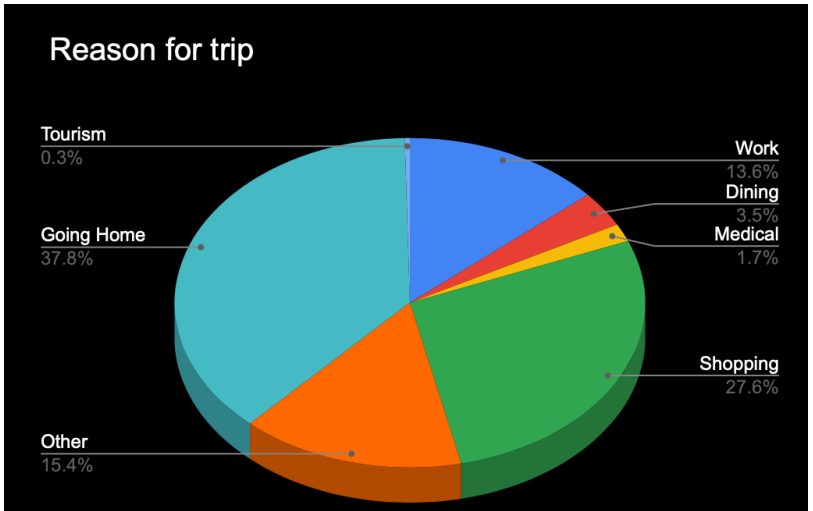
Deployed: December 14, 2020

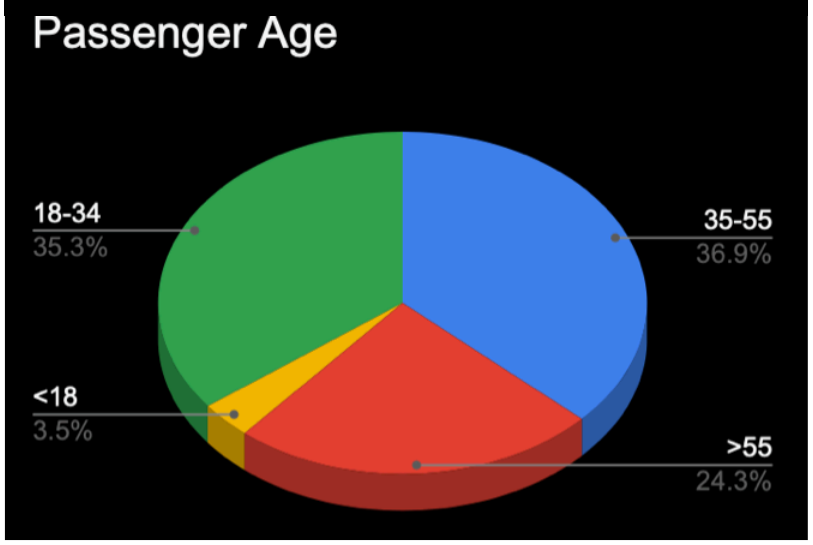
As of April 26, 2021
- **799 rides**
- **955 passengers**

eCab paratransit

Progress

LONE STAR CLEAN FUELS ALLIANCE
A DOE Clean Cities Coalition Serving Central Texas





In-depth Data Collection

Livewire Data Platform

Table 3. Destinations of eCab Trips

Destination	# of Trips	% of Trips
House	84	36.1%
Wal-Mart	25	10.7%
Tracy's Drive-in Grocery	15	6.4%
H-E-B Grocery	12	5.2%
CARTS Bastrop Park & Ride	8	3.4%
Post Office (Downtown)	6	2.6%
Downtown Bastrop	5	2.1%
Dollar General	4	1.7%
Bastrop City Hall	2	0.9%
Bastrop Public Library	2	0.9%
El Nuevo Mexico Restaurant	2	0.9%
First National Bank	2	0.9%
Goodwill	2	0.9%
Metro PCS	2	0.9%
Texas Workforce	2	0.9%
Walgreens	2	0.9%
Unknown	38	16.3%
Other (1 trip each; include medical, retail, civic, restaurant destinations)	20 (1 each)	8.6%
Total	233	100.0%

Progress

Feedback:

- Community
- Users
- eCab Destinations

LONE STAR CLEAN FUELS ALLIANCE
A DOE Clean Cities Coalition Serving Central Texas

Bastrop, TX Electric Cab "eCab" Service Survey

What is your experience with... (check all that apply)	None	Driving	Riding as a Passenger	Owning	Renting
1. electric vehicles	❒	❒	❒	❒	❒
2. low-speed electric vehicles Note: Low-speed electric vehicles (LSEVs) are NOT golf carts or full-size electric cars. LSEVs are required to have seatbelts and have a maximum speed of 25mph.	❒	❒	❒	❒	❒
3. golf carts	❒	❒	❒	❒	❒
How likely will you....	**Unlikely**	**Somewhat Unlikely**	**Undecided**	**Somewhat Likely**	**Very Likely**
4. try the "eCab" service at least once?	❒	❒	❒	❒	❒
5. use the "eCab" service at least once a week?	❒	❒	❒	❒	❒
6. recommend "eCab" service to someone?	❒	❒	❒	❒	❒
7. prefer to use the cell phone app instead of calling for the "eCab" service?	❒	❒	❒	❒	❒
8. be concerned about your personal safety while riding in an "eCab" vehicle?	❒	❒	❒	❒	❒
9. enjoy riding in the "eCab" vehicle?	❒	❒	❒	❒	❒

Progress

LONE STAR CLEAN FUELS ALLIANCE
A DOE Clean Cities Coalition Serving Central Texas

Table 6. "First Mile" Origins to CARTS Bastrop Park & Ride

Origin	# of Trips	% of Trips to CARTS
Post Office	2	25.0%
Wal-Mart	1	12.5%
Bastrop City Hall	1	12.5%
Downtown Bastrop	1	12.5%
First National Bank	1	12.5%
H-E-B	1	12.5%
House	1	12.5%
Total Trips to CARTS	8	

Figure 26. Large Surface Parking Lot at H-E-B in Bastrop

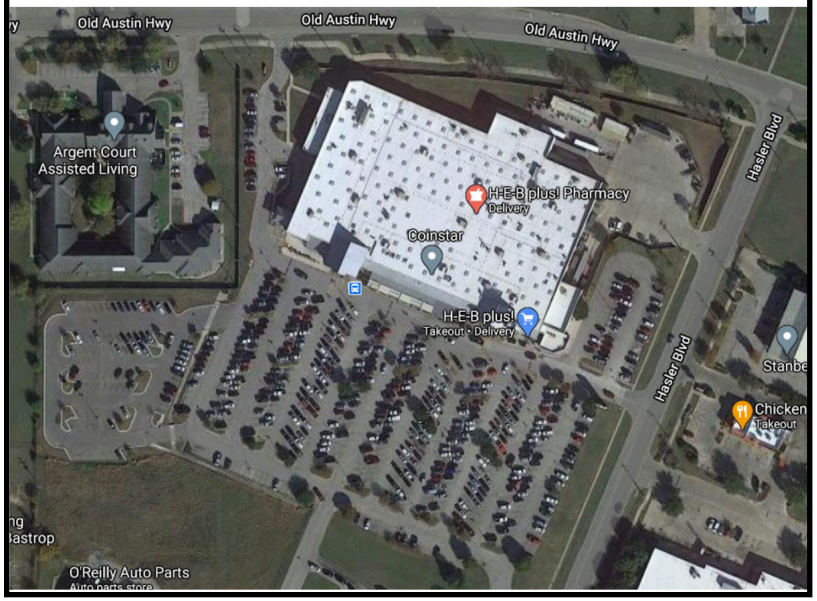


Figure 6. Bastrop Roadway Traffic Delay Example (Tuesday PM Peak Hour)

Transit, parking & traffic baseline evaluations

Collaboration

LONE STAR CLEAN FUELS ALLIANCE
A DOE Clean Cities Coalition Serving Central Texas

Collaborator	Relationship	Expertise Mix / Project Impact
Lone Star Clean Fuels Alliance- Prime	Clean Cities Coalition	Project Management
CARTS - Rural Transportation System	Key Partner, Clean Cities Stakeholder	Rural Transit
eCab- sub recipient	Clean Cities Stakeholder	Provide LSEVs & Drivers, Data Collection
Wheels & Water - sub	Clean Cities Stakeholder	Data Collection & Analysis
NREL - National Lab	National Lab	Data Analysis, Collaboration on Data Collection, Livewire host

Coordination

- Monthly video calls
- eCab/ LSCFA, Wheels & Water monthly reports
- Regular communication with team & local partners
- Quarterly progress reports
- NREL's quarterly calls with rural mobility cohort

Overall Market Impact

LONE STAR CLEAN FUELS ALLIANCE
A DOE Clean Cities Coalition Serving Central Texas

Contribution: Develop foundation for LSEV use in First Mile /Last Mile

Accomplishments to Date: (thru April 30, 2021)

Current:
- LSEVs operating in on-demand application in rural transit
- LSEV paratransit operating
- Data feeding real time into Livewire
- LSEVs introduced to community
- Baseline assessments for transit, traffic and parking

Upcoming:
- Surveys and interviews of store owners, riders, community
- Log barriers to acceptance / adoption and best practices
- Increase education of LSEVs for FM/LM through community outreach and regional discussions / webinars
- Update transit, traffic and parking assessments

Summary

LONE STAR CLEAN FUELS ALLIANCE
A DOE Clean Cities Coalition Serving Central Texas

Objectives	Barrier	Impact on Barrier	VTO Goals
• Develop, demonstrate & refine affordable, accessible, sustainable & replicable **LSEV FLM shuttle applications**	• **Limited understanding** of LSEV potential in rural transit operations	• Create **community awareness** of LSEV FLM capabilities	• **Affordability** for business and consumers: lower initial cost & maintenance than traditional options
• **Collect data** for analysis, sharing and public dissemination	• Barriers to LSEV usage **and best practices** to support usage	• Collect **robust rider data** from vehicle telematics and driver interface	• **Economic growth**: additional riders, fun/safe factor, introducing EVs
	• Limited **quantitative** data supporting LSEV usage	• Document **best practices** and **potential barriers**	• **Reliability/ resiliency:** diversity, hedge against fuel costs
		• **Introduction** to EVs	• **National security**: fuel diversity, domestic fuel

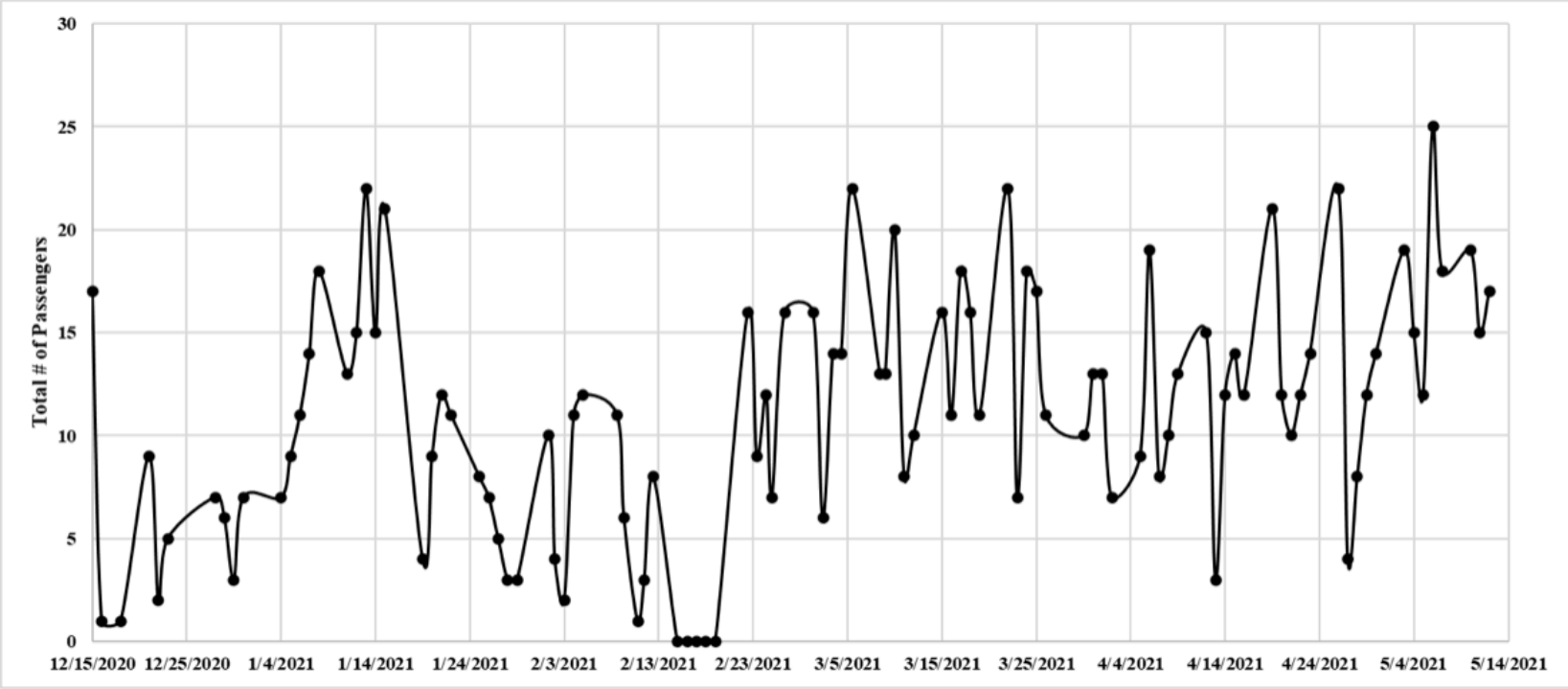
Divider

LONE STAR CLEAN FUELS ALLIANCE
A DOE Clean Cities Coalition Serving Central Texas

Technical Back-up

LONE STAR CLEAN FUELS ALLIANCE
A DOE Clean Cities Coalition Serving Central Texas

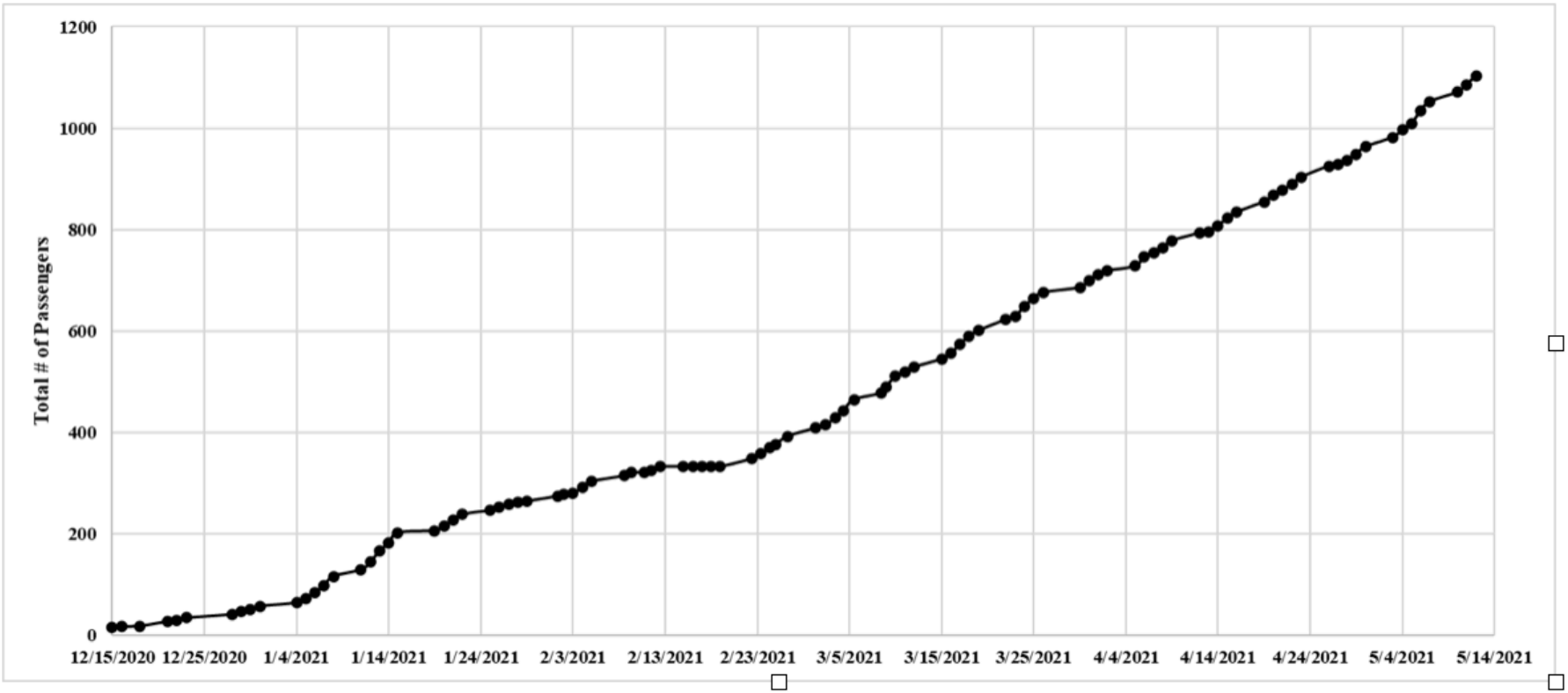
The daily ridership since the launch of eCab. The zero ridership during the week of February 14-19, 2021 was due to winter storm Uri.



Technical Back-up

LONE STAR CLEAN FUELS ALLIANCE
A DOE Clean Cities Coalition Serving Central Texas

The cumulative ridership since the launch of eCab in Bastrop, Texas.



Technical Back-up

LONE STAR CLEAN FUELS ALLIANCE
A DOE Clean Cities Coalition Serving Central Texas

Table 4. Origins of eCab Trips

Origin	# of Trips	% of Trips
House	80	34.3%
Wal-Mart	30	12.9%
CARTS Bastrop Park & Ride	25	10.7%
Tracy's Drive-In Grocery	15	6.4%
Downtown Bastrop	14	6.0%
H-E-B Grocery	14	6.0%
Bastrop City Hall	9	3.9%
Post Office	4	1.7%
Dollar General	3	1.3%
MNP Vape Shop	3	1.3%
Food Bank	2	0.9%
Texas Work Force	2	0.9%
Walgreens	2	0.9%
Unknown	9	3.9%
All others 1	21 (1 each)	9.0%
Total	233	100.0%

Additional Data Collected