U.S. Department of Transportation
Federal Highway Administration

FHWA E-bike Case Study Series

FHWA-HEP-23-023

Using E-bikes to Expand Access and Mobility for Essential Workers in Detroit, Michigan

The onset of the COVID-19 pandemic in the spring of 2020 led to significant changes in travel and mobility patterns across the United States. Public transportation providers imposed service cuts and many shared bikes and electric scooters (e-scooters) were temporarily removed from the streets in response to public health mandates. In Detroit, these limitations on mobility were felt most acutely by frontline workers who lacked safe, affordable, and dependable transportation services to reach their jobs. Detroit's Office of Mobility Innovation (OMI) recognized the mobility challenges facing essential workers and devised a pilot program to provide electric bicycles (e-bikes) and e-scooters to essential workers to expand access to equitable and affordable mobility across the city.

Program Overview

In June 2020, Detroit launched a pilot program to provide select frontline employees with e-bikes and e-scooters for reliable and safe transportation to and from their place of employment. The program emerged from a partnership between OMI and the New Urban Mobility Alliance (NUMO) and Next Energy, who both provided technical assistance and resources in support of the pilot program.

City staff identified several local grocery stores and hospitals as partner employers to participate in the pilot program. Detroit developed and distributed an enrollment form to assess the mobility needs of individuals at these select employers. The enrollment form provided a benchmark of individual commuting habits and helped OMI arrange mobility solutions that would best fit these employees' needs.

The e-bike and e-scooter pilot program targeted city residents living up to six miles away from their workplace, as the limitations of device battery life would complicate longer commutes.[1] After reviewing

[1] Detroit led an additional pilot targeted for residents living more than six miles away from their workplace that offered essential workers discounted access to public transit to meet their mobility needs.

the enrollment forms, the city reached out to qualified employees at the participating grocery stores and hospitals to collect more information on individual commutes and identify what resources would be necessary to implement and support an effective program. This outreach process consisted of 180 phone calls with residents and was critical for alleviating concerns, answering applicants' questions, and explaining what technical assistance would be available through the program.

In addition, the city reached out to the facility managers at participating employers to ensure that pilot program participants would have access to electric charging stations and a safe place to park their e-bike or e-scooter during work. The employers were receptive to the program, interested in identifying strategies to ease the commute for their employees, and willing to provide the necessary infrastructure to support the pilot program.

Pilot Implementation

Beginning in June, the city distributed 59 e-bikes and four e-scooters to qualified residents living up to six miles away from their workplace. Program participants also received helmets, locks, route planning tips, and maintenance services. These tools were integrated into the program to ensure that residents would have the necessary resources to safely move throughout the area and that participants who had limited experience riding bicycles would be comfortable with the program.

A large company with a strong philanthropic presence in Detroit donated the e-bikes for the pilot program and MoGo, a nonprofit organization that runs Detroit's docked bikeshare system, provided the operations and maintenance services. Meanwhile, the e-scooters were purchased from a private company. NUMO and Next Energy provided financial backing and additional technical resources. The structure of the partnership allowed pilot program participants to pay a one-time $10 fee for the 16-week long program.

Throughout the pilot program, staff arranged several ways for participants to provide anonymous feedback to assess the effectiveness of the program and to determine if there was a need to make any changes. City staff distributed surveys at the one-month and two-month marks, as well as a final evaluation survey at the conclusion of the pilot program. These surveys provided the city with insight into how the pilot was going and yielded a number of key findings:

- 42 percent of respondents reported more on-time arrivals by using an e-bike for commuting.
- Pilot participants typically used the e-bike 3-6 times per week.
- Over 50 percent of respondents were able to access their jobs within 30 minutes.
- 90 percent of respondents felt safe when riding an e-bike.

The positive feedback received through the survey was a contributing factor to extend the pilot program for an additional month. In addition, the successful reception of the e-bike pilot program led to a second 2021 e-bike leasing pilot program, conducted from May 2021 to October 2021, that supported Detroit-based employees and front-line workers, allowing them to lease e-bikes for $15 per month. Overall, 110 Detroit-based employees, representing 10 employers, participated in this second program.[2] About 80 percent of participants reported that the leased e-bikes served their transportation needs. The program

[2] Detroit in Motion: Impacts of Community-Centered Bike Programs on Detroiters. 2022

saw a 17 percent increase in participants riding to work. The program assessed differences between participants' anticipated barriers to e-biking before the lease period and barriers encountered during the lease period, finding that inclement weather was more of a perceived than actual challenge.

Key Takeaways

The pilot program's evaluation process yielded a number of lessons learned and key considerations for the future.

Develop strong and trusting relationships with residents. In the development of the pilot program, staff made it a focus to meet people where they are and to be responsive to residents' needs and potential barriers. The significant upfront investment in outreach ensured that the city understood the concerns of residents and allowed them to design a program and solution that would fit the community's needs.

Establish channels for clear and consistent communication. Staff at OMI were available by phone, text message, and email and were willing to adapt the program based on feedback from the public. This included recognizing the impact that the COVID-19 pandemic had on overall mobility and structuring the pilot program to provide participants with the freedom to use e-bikes to access recreational opportunities, complete errands, or visit family, and not just commute to and from work.

Noteworthy Practice

Colorado's Can Do Colorado E-Bike spring 2021 pilot program awarded $700,000 in grants to help expand e-bike access for low-income and essential workers across the State. The program seeks to improve access and mobility for traditionally underserved populations, while maximizing air quality benefits.

Recognize the vulnerability wrought by the COVID-19 pandemic. The pandemic has disproportionately burdened essential workers and low income households. Staff at the city were acutely aware of these impacts and integrated empathy and patience throughout the pilot to best serve and accommodate individual needs. While the pilot program formally ended on October 31, 2020, OMI has actively looked into future funding opportunities and partnerships to continue the program and prioritize the needs of essential workers throughout the COVID-19 recovery process. Staff in Detroit have also considered the effectiveness of working through employers to reach traditionally underserved residents as a potential outreach strategy for future pilot projects.

U.S. Department of Transportation
Federal Highway Administration

FHWA E-bike Case Study Series

FHWA-HEP- 23-024

Durango, Colorado Conducts E-bike Pilot on Natural Surface Trails to Expand Access for Users

The city of Durango, Colorado, with a population of approximately 18,500[1] located on the San Juan Skyway All-American Road and just east of the Trail of the Ancients National Scenic Byway, is considered to have some of the best single track mountain biking in the world. Several high-profile bicycling races have been hosted in the diverse mountain setting, including the USA Pro Cycling Challenge and the Iron Horse Bicycle Classic, one of the largest and longest continuously run bicycling events in the United States. These activities have supported a large tourism industry. About 30 percent of jobs in La Plata County, where Durango is located, directly relate to tourism, and the tourism industry accounts for one-third of Durango's annual tax revenues.[2] Tourism is growing in the region as emerging technologies, like electric bicycles (e-bikes), increase access to the surrounding vistas. In response, the city of Durango has explored how to incorporate e-bikes on city pathways and trails.

As part of a multiyear effort, the city has been studying how e-bikes may affect the experiences of other users on trails. In June 2020, Durango began a one-year trial period that allowed e-bikes on natural surface trails in the Twin Buttes trail system. The pilot effort built on previous studies, such as the city's decision to allow e-bikes in the Animas River Trail in 2017. The Twin Buttes trial focused on community perceptions of how e-bikes may impact their overall experience of the area. After the pilot ended, the city permanently allowed e-bikes on select soft surface trails within the Twin Buttes trail system. As of 2022, there are no plans to expand e-bike access in other areas with soft surface or natural surface trails.

Laying the Groundwork for E-Bike Use on Natural Surface Trails

Initially in 2016, the Durango City Council briefly banned e-bikes as a precautionary safety measure while conducting safety and educational efforts on the Animas River Trail, a hard surface trail which

[1] As of 2019, per the U.S. Census Bureau.
[2] 4 Ways Tourism Impacts the Durango and La Plata County Economy, May 5, 2020.

functions as a connector to several other trail systems.[3] In 2018, after a one-year trial period on the Animas River Trail, the city voted to approve Class 1 and Class 2 e-bikes on specific hard surface trails within the city as well as city streets and bike lanes. The decision was based on positive feedback received through public engagement and limited complaints during the trial period.

E-bike Classes

Class 1: pedal assist, max assisted speed of 20 mph

Class 2: throttle assist, max assisted speed of 20 mph

Class 3: pedal assist, max assisted speed of 28 mph

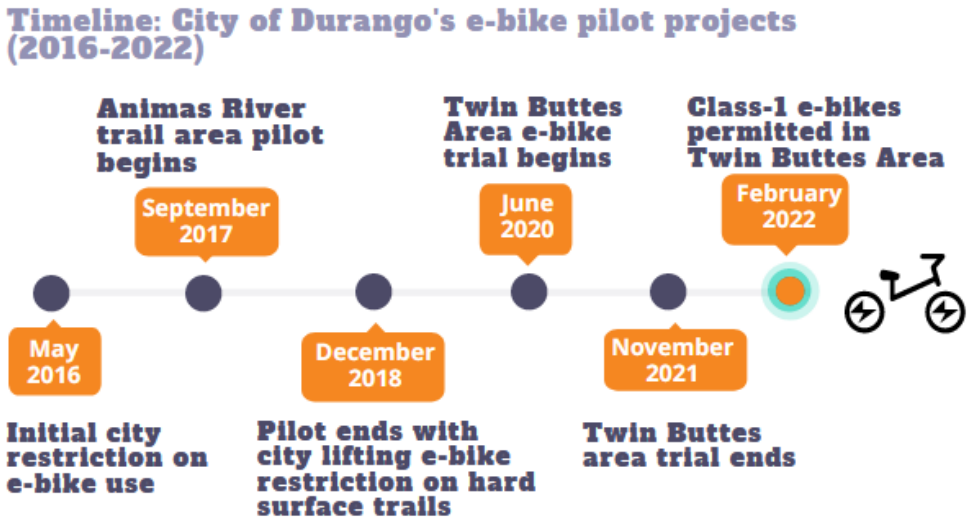
Source: 23 U.S.C. § 217(j)(2)

Twin Buttes Trail System E-bike Pilot

The success of the Animas River e-bike trial inspired further conversations within the community on whether e-bikes should be allowed on natural surface trails. Before 2022, motorized vehicles, e-bikes, and motorized scooters were not permitted on any natural surface trails in Durango. Similar to how the city explored e-bike use on hard surface trails, they studied user experiences on soft surface trails.

In June 2020, Durango initiated a trial program allowing Class 1 e-bikes in the Twin Buttes trail system to determine how they would operate alongside other users. Twin Buttes contains 10 miles of natural surface trails and was chosen for the trial because the majority of trails are self-contained within the Twin Buttes boundaries, avoiding jurisdictional issues. In 2020, the city focused on placing signage throughout the trail system to inform users of the trial and e-bike etiquette.

During the trial period Durango offered several opportunities for public engagement to better understand perceptions and community preferences for e-bikes on recreational trails. An initial public forum hosted over 100 community members. The comments at the meeting were split evenly on whether e-bikes should have access to natural surface trails. The trial also included a trailhead intercept survey asking trail users about their perceptions and opinions of e-bikes.



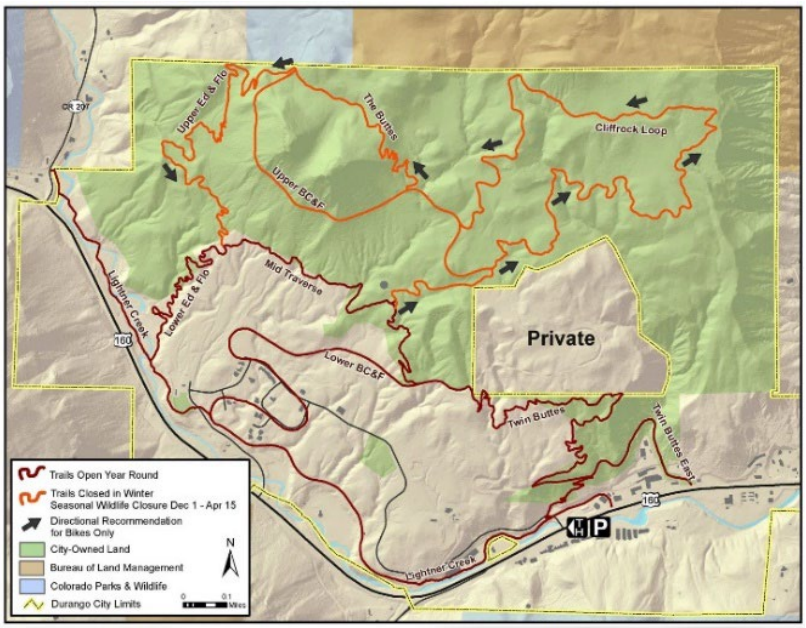
Timeline: City of Durango's e-bike pilot projects (2016-2022). Image courtesy of U.S. DOT Volpe Center.

[3] Durango Bans Pedal-Assist Bikes on Trails, May 6, 2016.

As part of the pilot, Durango conducted an education campaign on e-bikes and their appropriate use by partnering with community stakeholders, including bike shops and schools. The city educated and informed residents and visitors on the appropriate use of e-bikes via their website and trifold brochures. The brochures are very popular and can be found at recreation facilities and the welcome center for tourists. City staff also fostered relationships with local bike shops and advocacy groups to help distribute information on e-bikes by providing brochures and posting on social media. The trial period for the Twin Buttes trail system concluded on November 30, 2021, and the analysis of data from the surveys and public comment concluded on January 26th, 2022. After consideration of the data, the City of Durango approved the use of Class 1 e-bike use only on select soft surface trails within the Twin Buttes trail system.

Implementation Challenges

Multi-jurisdictional trail networks necessitate cooperation among public land managers. A key component of the Durango's e-bike regulatory approach involves consistent, open communication with other public land managers. Much of the trail infrastructure throughout the city connects seamlessly into Federal public lands. However, many of the Federal lands are Bureau of Land Management (BLM) special recreational management areas (SRMAs) have not been designated as open to off-road vehicle (including e-bike) use. The BLM has been reviewing whether to provide access to e-bike users in response to the regulatory developments initiated by the Department of the Interior (DOI) Secretarial Order 3376.[4] BLM SRMA properties in the La Plata County area have decided that e-bikes will be prohibited until further studies can determine e-bike impacts on natural surface trails. Throughout the pilot process, the city has maintained a constructive dialogue with BLM and other land management partners. If Durango grants e-bike access on natural surface trails in other parks, the city anticipates a need for interagency cooperation to identify trail connections, educate riders on what properties they can ride on, and coordinate enforcement resources. In anticipation of these potential challenges, the city and adjacent land management agencies have established an informal regional alliance that aims to develop consensus on solutions well before any jurisdictional conflicts arise.



Twin Buttes Trail System. Image courtesy of city of Durango.

Resources have been constrained by the pandemic. It has been difficult to dedicate resources to the Twin Buttes Area trial as staff focus has shifted due to the COVID-19 pandemic. Furthermore, the

[4] DOI Secretarial Order 3376, Increasing Recreational Opportunities through the use of Electric Bikes, August 29, 2019.

city has yet to determine if the pandemic has impacted how frequently residents use the Twin Buttes trail system. Durango extended the trial period to end in November 2021, so that the city could obtain sufficient public feedback over a full summer season.

Management of e-bike behavior requires both enforcement and education. City park rangers patrol the trail system, but they are not authorized to issue citations. Further, Durango has not modified local codes that regulate behaviors on trails to expressly address e-bike usage. Developing enforcement strategies and codes may be another outcome of the trial. The city has focused on educating trail users on proper trail etiquette as a strategy for managing behavior, for example, by publishing a brochure with information on e-bike rules and etiquette.

Key Takeaways

Durango's e-bike pilots have expanded access to outdoor recreational opportunities. The city's implementation of these trials highlights takeaways for other jurisdictions interested in standing up similar initiatives.

Public engagement is crucial. The city of Durango understood the importance of public engagement when making community decisions. By conducting a trial, community members could experience e-bikes firsthand and provide input on their experience with them. While the city conducted extensive research on e-bike safety and how they function alongside other users, decisions about management strategies on natural surface trails were also guided by residents' experiences and input.

Trial periods can help fine tune policy implementation. Trial periods allow localities to determine what educational materials and potential enforcement is needed based on their communities' preferences. Because many of Durango's natural surface trails are on lands under conservation easements, a blanket e-bike ordinance, similar to the hard surface decision, was not considered appropriate. Instead, the council is determining specific trails and systems where e-bikes are and are not allowed. The Durango City Council developed their policy position to permanently allow Class-1 e-bikes on Twin Butte's natural surface trails based on the findings from the pilot. Public commentary helped the City Council understand community sentiment about e-bikes on natural surface trails, and surveys conducted on the trail system indicated that there were minimal conflicts between e-bike riders and other trail users. This information informed the substance of the policy outcome and gave the Durango City Council confidence that the outcome reflected the community's desires.

U.S. Department of Transportation
Federal Highway Administration

FHWA E-bike Case Study Series

FHWA-HEP-23-025

Nice Ride Bikeshare System in Minneapolis Integrates E-Bikes into its Fleet

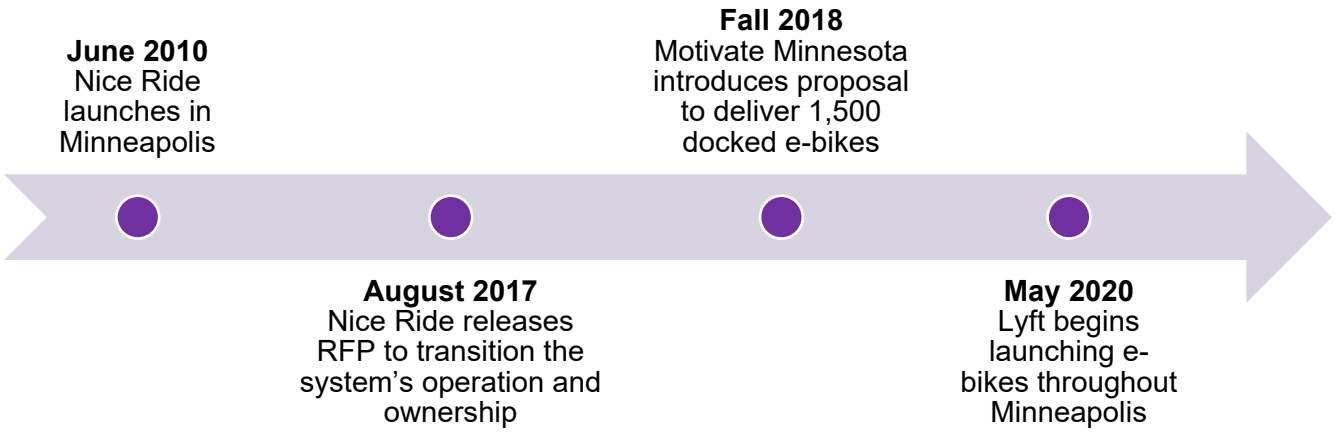
The city of Minneapolis launched its bikeshare system, Nice Ride Minnesota, in 2010. Nice Ride was created as a nonprofit and used grants from the Federal Highway Administration and from corporate sponsors to purchase and operate 65 stations and 700 bicycles in its first season. Nice Ride was the second large-scale bikeshare program created in the United States, and Nice Ride staff played an instrumental role in the formation of the North American Bikeshare Association to share key takeaways and lessons learned with industry partners. The system rapidly grew to 200 stations and 1,850 bicycles in 2017; however, an industry shift to dockless bikeshare threatened to derail operation of the system. This case study explores Nice Ride's transition to and focus on electric bikes (e-bikes) within its fleet.

E-bike in the Nice Ride fleet. Image courtesy of Nice Ride.

Program Transition

In 2017, the bikeshare industry began to undergo a major transition. Dockless bikeshare start-ups launched in cities across the United States and the world with low-cost bicycles that could be parked anywhere and did not require docking stations. These systems introduced additional competition to traditional docked bikeshare systems, and Nice Ride began to explore opportunities to integrate its docked bikeshare operations with a dockless provider. The system's Board of Directors published a request for proposal (RFP) to identify a potential partner that would meet existing service levels and deliver a dockless bike pilot program, while committing to system-wide goals for equity and maintaining a clear right-of-way for pedestrians.

Motivate Minnesota won the bid and committed to continuing to operate the system's docked bikeshare system and to provide a dockless bike pilot program beginning in 2018. During this transition, Motivate Minnesota (which Lyft acquired) took over the management and operation of the bikeshare system from Nice Ride Minnesota. Under the new arrangement, Nice Ride Minnesota holds the licensing agreement with the city, helping to provide a bridge between investment from the private sector and public agency goals. As the bikeshare industry continued evolving, Lyft worked with the city to pivot away from a dockless bike pilot program to an opportunity to integrate e-bikes into the existing station-based bikeshare system. Lyft collaborated with Nice Ride Minnesota to plan and deliver a pilot program that introduced 50 docked e-bikes into the city's bikeshare system in 2019. The timeline below outlines Nice Ride's transition.

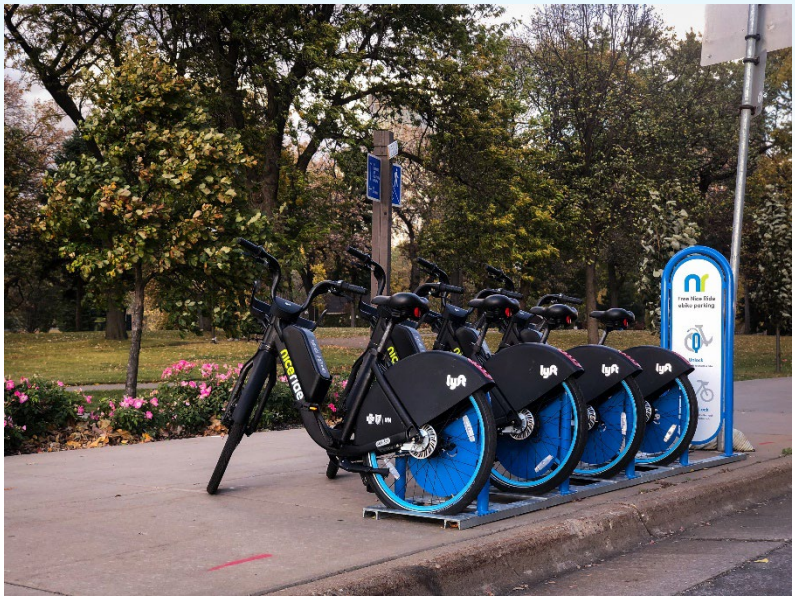


Program Overview

The e-bike pilot program proved successful in delivering e-bike access to the region, and Nice Ride moved forward with a plan to integrate 2,000 new e-bikes into the bikeshare system. The e-bikes provide pedal-assistance up to 18 miles per hour and can typically function for around 25 miles or three days on a single charge. The e-bikes also have a lock-to feature, which provides the public with substantial flexibility regarding where to park their e-bikes. The initial e-bike rollout has been popular, with Nice Ride seeing around one trip per day across the e-bike fleet compared to 0.25 trips per day with the traditional bicycle fleet. Nice Ride expects these numbers to continue increasing as the e-bike fleet is fully deployed.

The lock-to feature on the e-bikes allows individuals to park them at bike racks throughout the Minneapolis area. Image courtesy of Nice Ride.

The program's rollout relied on extensive coordination with the University of Minnesota, Minneapolis Park and Recreation Board, and city of Minneapolis. Nice Ride also coordinates regularly with the National Park Service due to the popularity of riding within



Lightweight station installed by Nice Ride for individuals to park e-bikes. Image courtesy of Nice Ride.

the Mississippi National River and Recreation Area. These stakeholders engage in regular coordination meetings to discuss the placement of stations and resolve any issues that arise.

Nice Ride worked with the city to conduct a parking assessment and developed a set of hybrid parking options for the e-bike fleet that maximize flexibility and convenience for the public. Individuals may park e-bikes and conventional bikes at traditional docking stations; however, Nice Ride also rolled out 200 lightweight stations throughout the region to provide more physical parking options for the e-bike fleet. These stations have signage to clearly indicate that they are designed for e-bike and Lyft electric scooter (e-scooter) parking. The e-scooters also have lock-to cables and are co-branded as part of the Nice Ride system. These stations help to keep the right-of-way clear by providing additional locations to park e-bikes, but function without the extensive kiosk infrastructure found at traditional Nice Ride docking stations. Users may also lock the e-bike to any public bike rack within the service area for a $1 fee.

Lyft has invested resources to secure the e-bike batteries and has not had significant issues related to theft. Nice Ride staff are currently responsible for regularly swapping the depleted e-bike batteries in order to charge them; however, over time, the goal is to integrate charging capabilities into the docking stations to maximize efficiency and limit the need for staff to remove bicycles from operation for charging.

Equity Focus

A priority for Nice Ride was ensuring that the bikeshare system would be accessible to low-income Minneapolis residents. During the transition to operation by Motivate Minnesota in 2018, Nice Ride and Motivate Minnesota developed an Equity Plan that introduced a three-pronged approach to equity with the bikeshare system. The approach focused on (1) training and hiring staff from traditionally underserved communities, (2) offering affordable pricing and broad access, and (3) expanding coverage over time to underserved parts of the city.

The Equity Plan has been a driving force behind the bikeshare program and resulted in the creation of Nice Ride for All. The program is modeled off the Divvy for Everyone program in Chicago and offers $5 annual memberships to all Minneapolis residents 18 years and older who qualify for a State or Federal assistance program. This membership provides individuals with access to both e-bikes and traditional bicycles. To help spread the word about the program, Nice Ride initiated an ambassador program, which involved hiring local residents to help sign up interested individuals. Nice Ride also regularly

coordinates with relevant nonprofits to reach area residents and disseminate information. In its first year, Nice Ride registered over 1,000 individuals in the program. Nice Ride provides annual reports on the status of the Equity Plan focusing on the availability of bikes in underserved communities and is committed to working with partners to continue improving the effectiveness of the program in delivering bikeshare to all residents regardless of income.

Key Takeaways

Nice Ride is continuing with its plan to roll out 2,000 e-bikes across the Minneapolis area. Staff at Nice Ride identified a number of best practices and considerations for other cities and jurisdictions looking to integrate e-bikes into their bikeshare fleet.

Focus on quality and reliability. A driving force for Nice Ride during the transition from dockless bikeshare to e-bikes was a focus on delivering the public a quality product that could withstand the natural elements and acts of theft and vandalism. Nice Ride worked with the city to develop a number of parking options and has invested resources in theft protection to provide the public with a reliable product.

Integrate equity considerations throughout the system. Nice Ride developed the program to ensure that the bikeshare system would be available to area residents regardless of income. In order to generate buy-in from the public, Nice Ride also invested in the community by hiring staff and company ambassadors from traditionally underserved areas.

Acknowledge the uncertainties of working with emerging technologies. Emerging mobility technologies are evolving rapidly. Staff at Nice Ride noted the importance of building flexibility into contracting mechanisms to account for future changes and to continue delivering a quality product to the public.

Other Noteworthy Practices

A number of jurisdictions have established similar equity partnerships that focus on engaging underserved communities.

- Capital Bikeshare Community Partners Program – Capital Bikeshare coordinates with local nonprofits, government agencies, and social services organizations to help individuals sign up for Capital Bikeshare for All.
- Divvy for Everyone – The program, which provides a $5 annual membership to qualifying residents, employs a team of community outreach staff who focus on delivering access to Chicago's traditionally underserved South and West side neighborhoods.

U.S. Department of Transportation
Federal Highway Administration

FHWA E-bike Case Study Series

FHWA-HEP-23-026

New York City Supports Innovative Commercial Cargo Bicycle Pilot for Last-Mile Deliveries

New York City (NYC) is changing how New Yorkers get their packages by managing the largest cargo bicycle program in the country. On average, major freight delivery services deliver over 1.5 million packages in the city. In 2017, that amounted to 365 million tons of cargo. The New York City Department of Transportation (NYC DOT) projects that the amount of cargo entering, leaving, or passing through the city will rise to 540 million tons per day by 2045.[1] In one of the city's neighborhoods, East Midtown, larger box trucks (Class 5) deliver 64 percent of these parcels, placing a strain on street infrastructure.[2] Cargo electric bicycles (e-bikes) are a possible alternative vehicle type for deliveries to reduce injuries, congestion, and carbon emissions.

Cargo e-bike delivering packages in NYC. Image courtesy of NYC DOT.

In 2019, the NYC DOT's Freight Mobility Unit began testing a pilot program inspired by earlier programs in cities like Frankfurt, Germany and Utrecht, Netherlands to partner with freight delivery services to use cargo bicycles, including e-bikes, for deliveries.[3] The goal of the pilot program was to reduce congestion, improve safety by reducing on-street conflicts, and reduce greenhouse gas emissions. NYC has more than 1,400 miles of bike lanes that could be used for cargo e-bike deliveries. The city provided parking spaces for commercial cargo bicycles and training materials to operators in exchange

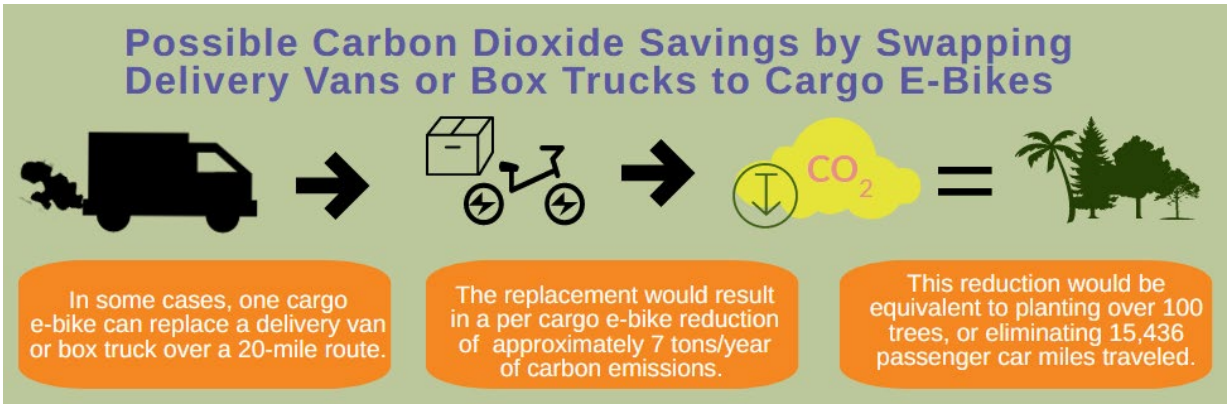
[1] Improving the Efficiency of Truck Deliveries in NYC, April 2019.
[2] Smaller trucks (Class 3) that are used by freight delivery companies accounted for around 24 percent, with the rest being made up by miscellaneous vehicles such as passenger cars and other utility trucks.
[3] NYC DOT is considering including throttle-based bikes and e-scooter trailer combos in the permanent program.

for travel data on deliveries. The pilot program benefitted New Yorkers by encouraging safer and more sustainable business-to-consumer deliveries.

Program Overview

The first freight delivery partners to participate in the NYC pilot program were Amazon, DHL, and UPS. The program launched with 100 pedal-assisted cargo e-bikes, with a maximum speed of 12 miles per hour. Soon after the pilot program started, additional companies joined, including FedEx, Reef Technology, and NPD Logistics. Since 2019, the fleets have grown to over 350 cargo e-bikes.[4] To participate in the program, companies followed pilot program guidelines and used newly constructed, specified cargo bike corrals to load and unload with the ability to charge their e-bikes on site. Participants in the pilot program were also allowed to load and unload in existing commercial metered zones at no cost. Based on population density, the program initially covered Midtown and Downtown Manhattan. The city expanded the program into Brooklyn and intends to expand the program to all its boroughs.

Most cargo e-bike deliveries occur on weekdays during daytime hours (9:00 AM – 5:00 PM with deliveries predominantly occurring during peak afternoon hours). Cargo e-bikes spend a short time (on average, 5 minutes or less) unloading deliveries at each address, which are usually on residential side streets. The city estimates that each bike makes four to eight trips per day. The program saw a 109 percent increase in cargo e-bike deliveries during the COVID-19 pandemic, with 21,000 trips occurring



Carbon emissions reductions resulting from the cargo e-bike pilot. Image adapted from NYC DOT Commercial Cargo Bicycle Pilot Evaluation Report.

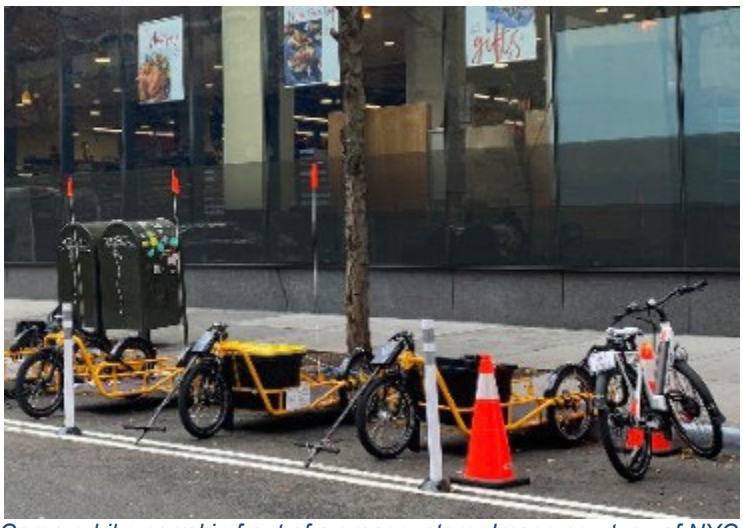
in May 2020 growing to 45,000 trips in January 2021. Most of this growth was due to the demand for grocery deliveries, but parcel deliveries have also increased, especially in residential areas. Each cargo e-bike covered an average of 20 miles per day, replacing delivery vans or box trucks at a rate of one to two cargo e-bikes per truck and reducing carbon emissions.

Providing the Infrastructure for Success

Safety is paramount and a critical component of NYC's program. According to the Commissioner of the NYC DOT, in 2018 and 2019, a disproportionately high number of cyclist fatalities have involved

[4] Commercial Cargo Bicycle Pilot: A New Mode for Last Mile Deliveries in NYC, May 2021.

trucks.[5,6] The cargo e-bike program presents an opportunity to reduce the number of delivery trucks operating within the city. NYC DOT requires that staff of companies participating in the pilot program attend safety training sessions prepared by city staff. Pilot program participants must also abide by safety requirements such as wearing reflective vests and knowing traffic safety rules. Since the beginning of the program, there have been no recorded incidents of crashes among the cargo e-bike participants.



Cargo e-bike corral in front of a grocery store. Image courtesy of NYC DOT.

NYC has committed to building cargo bike infrastructure to facilitate more seamless deliveries. On-street elements include cargo bike loading zones, which include flex posts and bike racks designated as a dedicated space to load and unload cargo. This space is available to participants of the pilot program at no extra cost. NYC DOT also plans to install signage at corrals to identify their locations and indicate that they are for cargo bicycle use. The NYC DOT sees potential in making the corrals even more convenient, safe, and efficient. Future innovative concepts for these spaces may include installing on-street charging stations for operators to use. The NYC DOT is also coordinating the expansion of protected bike and cargo bike lanes where possible.[7] Planning for the future bicycle network will consider the benefits of locating bike lanes near distribution hubs in order to incentivize last-mile delivery mode shift from trucks to cargo e-bikes.[8] In July 2022, NYC DOT released a Request for Expressions of Interest (RFEI) soliciting inputs from freight operators and other stakeholders to assist the city in establishing a pilot program to support micro-distribution centers in NYC. The RFEI sought information on land use and zoning restrictions impacting distribution hubs.

Key Takeaways

New York City's cargo bike program transitioned from a pilot program to an ongoing program in 2022. NYC DOT has goals of increasing enrollment in its cargo bike program to 2,500 bikes in 2026 and shifting 25 percent of last-mile freight deliveries from trucks to small, sustainable delivery methods by 2040. Key takeaways from the program include:

Density impacts program effectiveness. Despite expansion into Brooklyn, around 94 percent of the deliveries occur in denser portions of Manhattan. Participating companies need to make sure cargo e-bikes are efficient and cost effective. Denser locations allow cargo bikes to make many deliveries over

[5] Mayor de Blasio Announces Commercial Cargo Bike Program to Reduce Delivery Congestion, December 2019.
[6] 21 of the 37 cyclist deaths in 2018 and 2019 involved trucks and vans, and 17 of these deaths involved large trucks.
[7] Green Wave: A Plan for Cycling in New York City, July 2019.
[8] Commercial Cargo Bicycle Pilot: A New Mode for Last Mile Deliveries in NYC, May 2021.

a small area, whereas delivery trucks must contend with traffic and parking. In less dense areas, it is often more cost effective to use a truck to travel the longer distances between delivery addresses. Cities exploring cargo e-bike programs may want to strategically focus on the denser portions of their jurisdiction.

Standardized data collection supports decision making. To participate in the program, companies monitored and shared global positioning system (GPS) trip data with NYC DOT.[9] NYC DOT used the data to inform future policy changes regarding cargo e-bike usage. An important lesson learned was to start the data collection process with a dedicated template in mind. Initially, the city wanted the data collection to be convenient for operators so it would not be a barrier to entry into the program. However, the city received different formats of data sources from different providers, which created additional effort to manage and standardize the information. Eventually, NYC will use a micromobility data standard similar to the General Transit Feed Specification (GTFS) to streamline data maintenance.

Regulatory alignment sets the stage for private sector success. In April 2020, as NYC was piloting its cargo e-bike program, the State of New York legalized the use of all e-bike classifications. Previously, only pedal-assist e-bikes with a top speed under 20 m.p.h. were permitted with registration. However, the legislation established a maximum e-bike width of 36 inches. Cargo bikes greater than this standard are required to operate on travel lanes and cannot operate in bike lanes. This change significantly impacted freight delivery fleets since many parcel compartments have a wider design than the regulated specification. An effort is underway to amend the law to accommodate e-bikes up to 48 inches in width. Managing a cargo e-bike public-private partnership requires coordination among different public sector authorities. Participating companies in cargo e-bike programs should seek regulatory clarity from all jurisdictions in which they intend to operate. Likewise, municipalities should strive to provide regulatory certainty for private sector freight delivery partners.

Other Noteworthy Practices

Miami partnered with a freight delivery company and mobility logistics hub to pilot four cargo e-bikes. The e-bikes are tricycles with cargo containers capable of pulling up to 400 pounds. The city and partners expect that the replacement of trucks with these e-bikes will result in a reduction of 112 tons of carbon dioxide emissions per year.

Boston launched a cargo e-bike pilot in the summer of 2022. Between 2010 and 2018, online purchases in the metro area grew by more than 90 percent, further straining the narrow streets used by delivery trucks in the city. In preparation for the pilot, the city is investigating different cargo e-bike delivery models that provide the most impact while realizing the city's goals for mobility, safety, and sustainability. The request for information initiating this pilot referenced NYC's cargo e-bike program as a case study.

[9] Mayor de Blasio Announces Commercial Cargo Bike Program to Reduce Delivery Congestion, December 2019.

U.S. Department of Transportation
Federal Highway Administration

FHWA E-bike Case Study Series

FHWA-HEP-23-027

Philadelphia Bikeshare System Equitably Integrates E-Bikes into Fleet

The city of Philadelphia launched its bikeshare program, Indego, in 2015. Indego is a docked bikeshare system with 138 stations, 1,500 conventional bicycles, and almost 500 electric bicycles (e-bikes). The bicycles and stations are owned by the city of Philadelphia and manufactured by BCycle, LLC. The system is planned and managed by the city's Office of Transportation & Infrastructure Systems and operated by Bicycle Transit Systems, a business responsible for maintenance of equipment, marketing, and customer service. To fund the system, the city has leveraged private dollars from JPB Foundation and William Penn Foundation, Pennsylvania's Multimodal Transportation Fund, and Federal funds from the Transportation Alternatives Set-Aside and Congestion Mitigation and Air Quality Improvement programs.

A defining feature of the program has been a thematic and practical emphasis on equitable implementation that considers the racial and economic background of people the system serves. To that end, the system provides discounted ACCESS passes to low-income individuals, serving over 4,500 people since the program's inception.[1] Equity considerations have also informed docking station locations and programming and outreach efforts. The city is a member of the Better Bikeshare Partnership, an effort whose mission is to increase access to and use of shared micromobility systems in low-income and minority communities. Other partners include the National Association of City Transportation Officials, North American Bikeshare Association, and PeopleForBikes Foundation. This case study focuses on the city's addition of e-bikes to the bikeshare system.

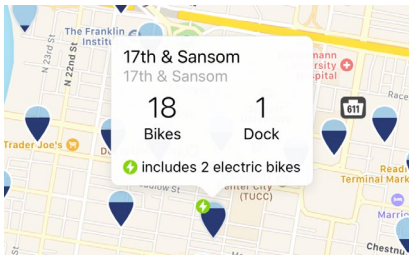
[1] ACCESS passes are available to Pennsylvanians eligible for medical, Supplemental Nutrition Assistance Program, or cash assistance benefits.

Program Overview

The city piloted 10 e-bikes in November 2018, initially making them available to users with no additional fees. In 2019, the city added 400 new e-bikes to the fleet and added new stations in the system's service area to boost capacity. In 2021, the system added an additional 300 new e-bikes, and by August 2022 had added 250 more. The e-bikes provide pedal assistance up to 17 miles per hour, can travel about 30 miles on a charge, and weigh only a few pounds more than traditional bicycles in the system.

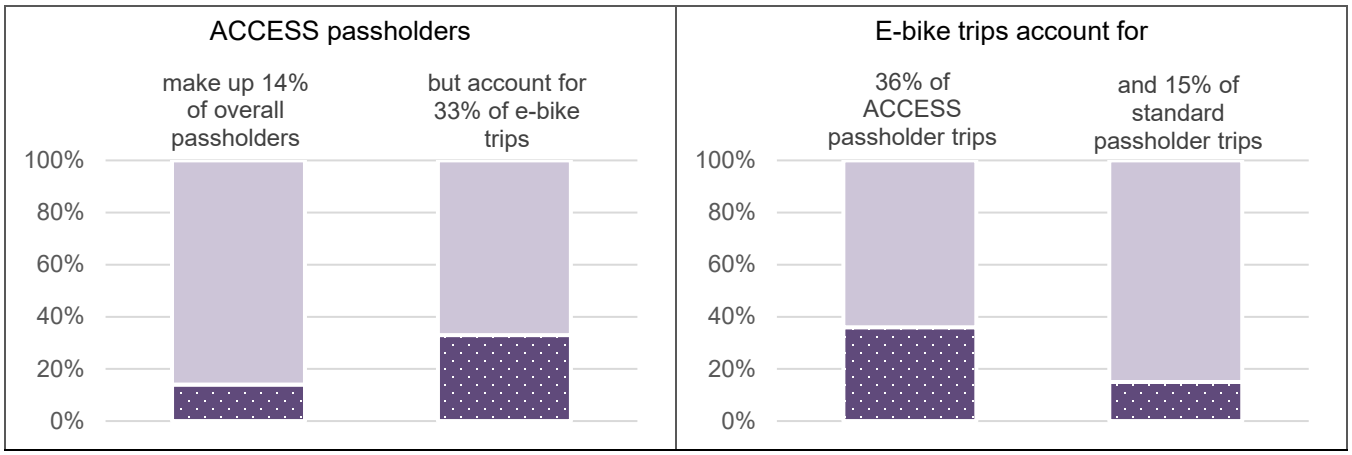
The e-bikes include a display that indicates remaining battery life. Image courtesy of Indego.

At a docking station, users can distinguish e-bikes from conventional bicycles by the frame color; the former are white and the latter are blue. Image courtesy of Indego.



Customers can locate e-bikes within the system by using the mobile app or online map, which identifies stations that have e-bikes with a green lightning bolt icon. Image courtesy of Indego.

During the pilot and early implementation, e-bikes were used more often than conventional bicycles and for longer trips. On average, each e-bike was used for four trips per day, compared with two trips per day for traditional bicycles. E-bike trips averaged 23 minutes, twice as long as trips taken on conventional bicycles.[2] Integration of e-bikes has helped the program better serve low-income users, as illustrated in the graphs below, likely due to low-income users' potentially greater need to replace transit trips with e-bikes during the COVID-19 pandemic and tendency to live closer to the edge of the system's service area, necessitating longer trips for which e-bikes are more beneficial. Philadelphia is also developing a Bicycle Network Plan to identify infrastructure improvements needed to support more and safer bicycle trips, including trips taken by underserved populations.



E-bikes' popularity and user adoption were particularly pronounced among traditionally underserved populations.

[2] Indego Annual Report: April 2019 to April 2020.

Implementation Details

The city ***engaged with the public***, including underserved populations, using community ambassadors and Spanish-language outreach efforts. Better Bikeshare Partnership efforts informed how the city conducted market research during the pilot (e.g., analyzing e-bike use by race and income) and determined how the city marketed the integration of e-bikes by using local models and photographers and highlighting communities of color in outreach materials. Across ages and demographic groups, public reception to the pilot and broader integration of e-bikes into the bikeshare system has been largely positive. Critical feedback was mainly limited to user perception that e-bikes do not provide opportunities for exercise and the higher cost of e-bikes. As the bikeshare fleet expands in the coming years, Philadelphia is targeting an even split between electric and conventional bicycles, helping to assuage public concerns about maintaining user choice of bicycle type.

To recharge e-bikes in a system of docking stations designed for a fleet of conventional bicycles, operator staff manually swap out depleted batteries and replace them with charged batteries. Batteries are charged at a central warehouse and are transported to docking stations via van or cargo e-bike. This means a rider can return an e-bike to any dock, instead of having to find a charging station.

The city prioritized earlier deployment of e-bikes over perfected supporting IT solutions. For example, the e-bikes initially lacked telemetric reporting of battery status, so the operator had to track the length of time each e-bike had been ridden since the last charge to estimate remaining battery life and predict when batteries needed to be replaced. The operator also used customer reports of dead batteries, and waived e-bike upgrade fees when customers made such reports. Bluetooth technology now enables e-bikes to communicate battery life to the station, allowing remote tracking of battery status. The city does not have plans to pursue station-based charging.

Tiered Pricing

Customers can use the bikeshare system by purchasing a 1-day pass, 30-day pass, or 1-year pass. The pricing scheme includes three categories of fees that vary based on the type of pass purchased:

1) A flat-rate pass fee that allows unlimited trips of a limited duration during the pass period
2) A per-minute usage or “extended time” fee that applies to trips that exceed the trip time threshold specified for each pass
3) A per-minute e-bike “upgrade” fee that applies to the full duration of all e-bike trips

Pricing varies between standard passes and discounted ACCESS passes. Flat-rate, extended-time, and e-bike upgrade fees for 30-day and 1-year passes are about one-third as expensive for low-income customers. The system does not provide a discounted 1-day pass.

The system also applies differential pricing for e-bikes and traditional bicycles, a pricing scheme Philadelphia developed following conversations with peer cities through connections developed by the Better Bikeshare Partnership. Based on the experience of New York and San Francisco’s bikeshare systems implementing a flat, per-trip surcharge for e-bike use, Philadelphia opted for a variable, per-minute surcharge for e-bikes.[3] Before implementing the new e-bike pricing, the city vetted several options with key community stakeholders to reach underserved, minority residents. Community feedback also informed the decision to apply a per-minute e-bike fee and to bill customers that fee on each day of e-bike use, instead of on a monthly basis, as was originally considered.

[3] New York and San Francisco now use a per-minute surcharge for e-bikes, charging an additional 12 to 20¢/min for e-bike trips, depending on the type of pass purchased.

As an example of how e-bike pricing works in practice, the marginal cost to the user of a 30-minute e-bike trip taken using a 30-day pass is $4.50, while the marginal cost of the same trip on a conventional bicycle is $0 (for 30-day ACCESS pass e-bike users, the marginal cost of the same trip is $1.50). The system does not charge the per-minute e-bike upgrade fee if only e-bikes are available at the docking station from which the bicycle is rented.[4] In response to the impacts of the COVID-19 pandemic on public transportation, Indego offered its monthly pass for $5 ($2.50 for a discounted ACCESS pass) from April through May 2020.[5] The table below presents pricing details for the system.

	Day Pass (24 hours)	Indego30 Pass (30 days)	Indego365 Pass (1 year)
Standard Pricing			
Flat-rate pass fee	$12 for unlimited 30-min rides	$17 for unlimited 60-min rides	$156 for unlimited 60-min rides
Extended-time fee	15¢/min for rides over 30 min	15¢/min for rides over 60 min	15¢/min for rides over 60 min
E-bike upgrade fee	15¢/min for full duration of ride	15¢/min for full duration of ride	15¢/min for full duration of ride
Discounted ACCESS Pass Pricing			
Flat-rate pass fee	N/A	$5 for unlimited 60-min rides	$48 for unlimited 60-min rides
Extended-time fee	N/A	5¢/min for rides over 60 min	5¢/min for rides over 60 min
E-bike upgrade fee	N/A	5¢/min for full duration of ride	5¢/min for full duration of ride

Key Takeaways

Philadelphia's integration of e-bikes into its bikeshare system is enhancing active transportation options for people in the city. The program's implementation highlights a few takeaways for other jurisdictions interested in standing up similar initiatives.

E-bikes expand access to and utility of bikeshare systems for underserved populations, including low-income and older individuals. Indego found that, between April 2020 and April 2021, half of ACCESS passholder trips were taken from low-income, residential stations. Integrating e-bikes into bikeshare systems makes these services relevant to populations that may not have otherwise considered using bikeshare.

A mixed fleet of e-bikes and traditional bicycles can serve various user groups and trip purposes; e-bikes have utility particularly for longer-duration, recreational trips that became more common during the COVID-19 pandemic.

Other Noteworthy Practice

Portland, Oregon's all-electric bikeshare system offers an equity program, BIKETOWN for All, which provides discounted pricing for individuals qualifying for certain State or Federal assistance programs. The program offers a $5 per month membership, provides $20 in monthly ride credits, and charges users only half the standard per-minute rental rate.

Getting e-bike pricing right can support both equity goals and the financial viability of bikeshare systems. Not only do Indego users perceive the differential pricing for e-bikes as fair, but e-bike rentals also account for a significant portion of the system's increased revenue. Although the marginal costs of e-bikes to operators are higher, e-bikes' increased popularity among users can make them a cost-effective addition to a bikeshare system. Community involvement confirmed that the differential pricing framework met the needs of underserved populations.

[4] Given the composition of the Indego fleet, this circumstance is unlikely, but the caveat addresses equity concerns raised by the public.

[5] Indego Blog: Riding Through This Together, August 21, 2020

U.S. Department of Transportation
Federal Highway Administration

FHWA E-bike Case Study Series

FHWA-HEP-23-028

Portland, Oregon Establishes Adaptive Bikeshare Program to Expand Mobility for Individuals with Disabilities

The city of Portland, Oregon is the largest city in the State of Oregon with a population of around 650,000. Over seven percent of its population typically commutes by bicycle, significantly outperforming the national average of less than one percent. In 2016, the Portland Bureau of Transportation (PBOT) launched BIKETOWN, a docked bike sharing system that provides the public with short term bicycle rentals through an annual membership or starting at $1 per trip plus 20¢ per minute. The system quickly grew in popularity and size but did not provide accommodations for individuals with disabilities. Shortly after the system's launch, PBOT received several formal requests for physical accommodation and began to explore alternatives that would provide individuals with disabilities access to bikeshare. PBOT developed a partnership with a local nonprofit and created an adaptive bikeshare program that included the use of electric bicycles (e-bikes) to expand mobility for residents.

Individual using an adaptive bicycle during the 2017 pilot. Image courtesy of PBOT.

Community Outreach and Pilot Formation

In response to the requests for accommodation, PBOT began an extensive outreach campaign to better understand the needs and interests of the community. This outreach included virtual and in-person open houses, presentations at clinics in the community, and the establishment of the Adaptive Bicycle Work Group,

which was composed of community members with disabilities and nonprofit and PBOT staff engaged with disability issues.

This community-driven engagement helped PBOT identify a common desire to provide a staffed adaptive bikeshare service that would provide individuals with disabilities with cycles and access to multiuse paths or trails in Portland. The coordination between partners led to the development of an adaptive bikeshare pilot program that ran from July to October 2017 and was the first of its kind in the U.S. In its first year, the program provided 59 rentals, 53 percent of which were to first-time adaptive cycle riders. The pilot program was extended for 2018, ran for six months, and provided 189 rentals, which represented a 220 percent increase from the previous year. The success of the pilot led PBOT to establish Adaptive BIKETOWN as a permanent program beginning in 2019.

Program Overview

Adaptive BIKETOWN operates through a contract between PBOT and Kerr Bikes, which is owned by Albertina Kerr Centers, a local nonprofit that provides programs and services for people with intellectual and developmental disabilities and mental health challenges. BIKETOWN and Adaptive BIKETOWN cross-promote through shared branding and marketing; however, the operations for the two systems are run separately. The separation between the two systems allows Kerr Bikes to use its expertise to provide a targeted service for individuals with disabilities and for PBOT to add adaptive bicycles after BIKETOWN launched. Through the contract, Kerr Bikes owns the adaptive cycles and provides servicing and maintenance, storage space, and technical expertise.

Individuals participating in a group ride with Adaptive BIKETOWN. Image courtesy of PBOT.

The system is run similarly to a bike rental program by allowing individuals to reserve a cycle online, by phone, or in-person for short-term use. Kerr Bikes is located along Portland's riverfront, providing users with access to several off-road trails and loops ranging from 2 to 11 miles. Kerr Bikes offers a range of different adaptive cycles to fit a diverse set of needs, and each rental includes a personalized fitting, a helmet, storage for a wheelchair or separate mobility device if needed, and a crate for a service animal during the rental time.

Adaptive BIKETOWN operates with a flexible pricing structure to ensure that the program is affordable and available to the public. Kerr Bikes offers discounted rates with the first hour free of charge and $12 for three hours for individuals who qualify for a TriMet Honored Citizens Pass (i.e., those with disabilities, Medicare recipients, and seniors age 65 and over) or for others who self-identify that they are unable to ride a traditional two-wheeled bicycle, whether due to injury, illness, or ability. The hourly rate for additional hours is $5. The rental rate for people who do not qualify as described above is higher and varies depending on the cycle. Within these parameters, the program also includes a limited amount of financial aid to ensure that the financial burden does not restrict individuals from participating in the program.

Addition of E-Bikes

The program began by offering 14 adaptive cycles and, in the first contract year, Kerr Bikes retrofitted an existing adaptive cycle using an e-assist conversion kit and purchased a second adaptive e-bike. As of 2022, the system has expanded to 27 adaptive cycles, including six e-bikes. The electric-assist adaptive cycles are capable of traveling 30 to 40 miles on a single charge at speeds reaching 20 miles per hour under electric motor pedal assist. The integration of e-bikes into the existing system has proven especially popular among community members. E-bikes have expanded the program to a broader set of individuals by providing access for individuals who may not have been comfortable riding conventional adaptive cycles. In addition, the e-bikes allow users to travel longer distances during their rental period. Kerr Bikes is actively looking into acquiring additional e-bikes to meet interest and demand from the public.

Noteworthy Practices

While Portland is one of the few cities to integrate e-bikes into their adaptive bikeshare fleet, a number of jurisdictions have established adaptive bikeshare programs.

- Adaptive MoGo – Detroit offers 13 different adaptive cycles available for short-term use.
- Bublr Bikes – Milwaukee directly integrated adaptive cycles into its docked bikeshare system.
- BORP Adaptive Cycling – Berkeley and San Francisco have led adaptive bike share pilots.

Next Steps

Despite reduced ridership impacts from the COVID-19 pandemic, both Kerr Bikes and PBOT are continuing to identify ways to expand the program. In 2021 and 2022, the program offered one-hour rentals at no cost to users. Kerr Bikes has also continued to identify opportunities for partnerships with physical and occupational therapy clinics to reach a broader population who may be interested in the program. For example, the program partnered with Parkinson's Resources of Oregon at an adaptive resource fair event, in which attendees could try out adaptive bikes.

Key Takeaways

Adaptive BIKETOWN staff identified a number of best practices and considerations for other cities or jurisdictions that are looking into adaptive bike share programs.

Allow the community to influence the program. The development of the Adaptive Bicycle Work Group was instrumental in defining and shaping the program. PBOT helped to organize numerous collaborative events but encouraged the stakeholders and relevant communities to define the priorities and shape the program in a way that would best meet their needs.

Make equity a priority. Adaptive BIKETOWN was developed to improve mobility for individuals with disabilities. PBOT and Kerr Bikes went a step further by dedicating resources and structuring the program to minimize the financial burden on individuals and make the program as accessible to the public as possible. For example, the program has organized group rides to encourage ridership among the public.

Engage with experts. Kerr Bikes has extensive experience engaging with individuals with disabilities and their staff possess the necessary knowledge to operate a bikeshare system. The partnership allowed PBOT to manage and fund the program, while allowing the experts at Kerr Bikes to run the day-to-day operations and use their skills and resources to engage directly with the community.

U.S. Department of Transportation
Federal Highway Administration

FHWA E-bike Case Study Series

FHWA-HEP-23-029

Seattle Parks and Recreation Connects Multimodal Trails for E-bike Use

The city of Seattle, known as the Emerald City, prides itself on its access to lush evergreen forests and a culture of outdoor recreation. Seattle Parks and Recreation (SPR) manages more than 120 miles of trails. Several other jurisdictions border Seattle city parks and share trail infrastructure. In 2018, Washington State passed legislation to regulate electric bicycle (e-bike) use on roads, sidewalks, and trails unless a local law prohibited their operation. When the law passed, SPR already had regulations prohibiting the use of Class 3 e-bikes on its trails. King County, with a population of more than 2 million and which includes Seattle,[1] has an extensive trail system that prohibited motorized vehicles on trails before the law was passed. Other adjoining jurisdictions, such as the Seattle Department of Transportation, had no prohibition at all. The inconsistent patchwork of regulations between SPR and other jurisdictions made it difficult for e-bike users to legally navigate the trail systems. To overcome this, SPR engaged with land managers from surrounding jurisdictions to align policies on use of e-mobility devices, including e-bikes, on trails.

E-bike Classes

Class 1: pedal assist, max assisted speed of 20 mph

Class 2: throttle assist, max assisted speed of 20 mph

Class 3: pedal assist, max assisted speed of 28 mph

Source: 23 U.S.C. § 217(j)(2)

In 2020, SPR approved the use of e-mobility devices on their trails. The 2020 Multiuse Trail Policy aligns SPR's e-mobility trail policy with those of adjacent jurisdictions such as King County and the University of Washington. SPR approached the policy changes using data-driven decision making while also engaging with stakeholder groups. Seattle saw the need to align its policies with other partners as an opportunity to not only harmonize with State laws, but also anticipate future emerging technologies and how their uses could be included in the updated policy. SPR worked closely with five land

[1] As of 2019, per the U.S. Census Bureau.

managing partners (Seattle Department of Transportation (SDOT), Washington State Department of Transportation, King County, Port of Seattle, and the University of Washington) to develop a pilot program, design surveys, and engage with the public to inform the policymaking process.

SPR installed signage along trails to inform the public of the e-bike pilot and the speed limit. Image courtesy of SPR.

On-the-Ground Data Collection

SPR conducted a one-year pilot program to learn more about potential impacts of e-bikes. The program began in August 2018 and allowed Class 1 and Class 2 e-bikes on several different recreational trails. SPR established a 15 mile per hour (mph) advisory speed limit for all devices, including traditional bicycles. The city installed small signs throughout high traffic trail areas to inform the public of the pilot program and to provide the speed limit advisory.

SPR worked with SDOT and the University of Washington to design surveys and perform onsite data collection. Staff visited the trails to observe how many people used the trails, the types of users (pedestrian, cyclists, e-cyclists), the speed of cyclists and e-cyclists, and how people used the local bikeshare systems.[2] They also observed the trails throughout the week and at different times of day in order to develop a complete understanding of trail traffic patterns.

E-bike user fills out SPR survey on a shared use path. Image courtesy of SPR.

Results from the data collection showed that average speeds for e-bikes and traditional bicycles were similar (14.9 mph for traditional bicycles and 14.8 mph for e-bikes). Furthermore, the study found that those who owned their own e-bikes, on average, rode faster at 16.8 mph. Riders using traditional bicycles and e-bikes from the bikeshare were slower compared to other users of private bikes, riding at an average speed of 11.9 mph.

[2] Seattle's bikeshare fleet includes both traditional bicycles and e-bikes. SPR noted that, as of 2021, there has been an increasing trend of users opting for e-bikes from the bikeshare.

SPR staff conducted surveys both online and in person with over 1,400 respondents. The primary purpose of the surveys was to determine user perceptions and opinions on how the trails should be used. In person surveys were not only conducted on city trails, but also at public engagement meetings conducted throughout the pilot program. SPR made an effort to engage a diversity of groups ranging from recreation advocates to the Seattle Commission for People with Disabilities. The survey received 200 in-person respondents and 1,200 online participants. A majority (74 percent) of respondents supported allowing Class 1 and Class 2 e-bikes on the trails. For SPR, the pilot program provided on-the-ground data that was critical in informing how to harmonize its e-bike regulations with surrounding jurisdictions.

Connecting Trails by Aligning Policies

The conclusion of the pilot program led to the development of SPR's Multiuse Trail Policy, which permits Class 1 and Class 2 e-bikes on SPR trails. SPR did not allow Class 3 e-bikes to ensure regulatory consistency with neighboring jurisdictions in accordance with the State legislation.[3] The surveys indicated public support for e-bikes being allowed on trails as well as support for limits to how fast they can be operated. As of August 2020, the Multiuse Trail Policy made the following changes:

- Established a mandatory 15 mph speed limit, or lower speed limits as necessary, for all users
- Allowed e-mobility devices (under 750-watt motor, e-assist stops at 20 mph) on multiuse trails
- Prohibited other forms of motorized vehicles
- Clarified roles and responsibilities

Soon after, partnering agencies followed by aligning their policies closely to SPR's Multiuse Trail policy. SDOT provides educational materials on how to use Seattle's multiuse trails. SPR has also shared the new policy with the multi-county Leafline Trails Coalition.

Key Takeaways

SPR's e-bike management approach harmonizes e-bike regulations across jurisdictions. SPR's development of the policy highlights takeaways for other jurisdictions interested in establishing similar e-bike regulatory strategies.

Identify and engage stakeholders early in the process. There were at least five major agencies managing jurisdictions adjacent to SPR's recreational lands. It was important to SPR to understand the regulatory framework at the State and local level as well as the actual ownership of the trail network. By engaging with agency partners early in the process, SPR got support for the pilot program and cultivated interest and buy-in for aligning local regulations. This support brought in resources and expertise. For example, SDOT helped SPR understand how much trail mileage SPR owned as it conducted its own trail upgrades plan, and the University of Washington's School of Public Health helped to design surveys.

[3] Washington State law requires that local regulations regarding the operation of Class 1 or Class 2 e-bikes on shared use paths that cross jurisdictional boundaries of local jurisdictions be consistent for the entire shared use path in order for the local regulations to be enforceable.

Real-world data helps to make a case. Objective data that better represented the realities of trail use helped SPR avoid relying on anecdotal observations. Recording average speeds within the trail system along with user perceptions from surveying 1,400 respondents allowed SPR to determine what speed limit was appropriate and what restrictions would be needed. On-the-ground data collection, in conjunction with research on best practices from other States, ultimately led to defensible and flexible policy recommendations.

E-mobility policy should aim to foresee emerging uses. The 2018 State legislation was a response to years of emerging e-mobility technologies (e-bikes, e-scooters, and electric personal assistive mobility devices) being introduced in the State. SPR observed that e-mobility technology was quickly evolving; for example, SDOT has expanded its bikeshare fleet to include e-scooters. Considering this and anticipating future changes to the e-mobility landscape, SPR's Multiuse Trail Policy allowed not just e-bikes, but any "electric-assisted micro-mobility devices with motors up to 750 watts that have a speed controller at 20 mph." This approach allows SPR to remain flexible so they can respond to changes in technology and align with changes in partnering agency policies.

U.S. Department of Transportation
Federal Highway Administration

FHWA E-bike Case Study Series

FHWA-HEP-23-030

Regulating E-Bikes in Virginia State Parks

The Virginia Department of Conservation and Recreation (DCR) manages the State's 39 parks, which are popular destinations for bicycling and contain 449 miles of trails open to cyclists. This case study focuses on Virginia DCR's development of a policy allowing class 1 and class 2 electric bicycles (e-bikes) on trails or paths designated for traditional bicycle use.

E-bike Classes

Class 1: pedal assist, max assisted speed of 20 mph

Class 2: throttle assist, max assisted speed of 20 mph

Class 3: pedal assist, max assisted speed of 28 mph

Source: 23 U.S.C. § 217(j)(2)

Program Background and Overview

DCR initially issued its e-bike policy in 2018, recognizing that e-bikes can provide an additional recreational option for visitors, particularly for bicyclists who may be discouraged from riding or unable to ride a traditional bicycle due to limited physical fitness, age, or disability. The original policy allowed class 1 e-bikes on trails where traditional bicycles were allowed but prohibited class 2 and class 3 e-bikes.

In formulating the policy, DCR conducted a survey through the National Association of State Park Directors, which identified potential safety and user conflict concerns around class 2 e-bikes, due to their ability to provide throttle-only assistance, and class 3 e-bikes, due to their ability to provide assistance up to 28 miles per hour.

DCR's policy was authorized under a 2012 State law allowing the use of e-bikes and electric personal assistive mobility devices on State trails where traditional bicycles were allowed. The Department did not identify a need for an e-bikes policy until 2018, as e-bikes gained popularity and visitor questions around their use on nonmotorized trails in State parks became more frequent.

The Commonwealth of Virginia passed additional 3-tier e-bike legislation, effective July 2020, which gave localities and State agencies with jurisdiction over bicycle and shared use paths options to prohibit

e-bikes on their shared use paths or natural surface trails based on e-bike class and type of path or trail, as described in the following table:

E-Bike Classes	Options for Prohibiting E-Bikes
Class 1 and 2	Can be prohibited *following notice and a public hearing* if it is found that such a restriction is necessary for public safety or compliance with other laws on *shared use paths*
Class 3	Can be prohibited *outright* with no required public involvement process on *shared use paths*
Any Class	Can be prohibited *outright* with no required public involvement process on *natural surface trails*

Following this legislation, DCR revised its e-bike policy and began allowing both class 1 and class 2 e-bikes where traditional bicycles were allowed. DCR's revised policy maintains a prohibition on class 3 e-bikes. Generally, the public has not voiced any issues with the policy, but the equestrian community expressed initial concerns around the potential for user conflict.

E-bike riding is a popular activity in Virginia's parks, especially the long distance recreational trails available at Pocahontas, New River Trail, and High Bridge Trail State parks. The conversion of an abandoned railway into a multiuse trail at High Bridge Trail State Park was funded through the Transportation Alternatives Set-Aside Program.

Next Steps
DCR is considering the following approaches to further implement the e-bike policy:

Develop bicycle path and trail use guidelines with appropriate best management practices. DCR's "Trail Development and Management Manual," which includes planning, design, construction, maintenance, and communications guidelines for trails, was last updated prior to the e-bike policy. It covers bicycle trail design considerations such as one way directionality, width, horizontal and vertical clearances, grade, sight distances, emergency and maintenance vehicle access, and user volumes.

Address any necessary policy changes through the Virginia State Park regulations. DCR will continue to monitor how the e-bikes policy may result in increased numbers of trail users overall, how e-bike users may displace other users, and whether further management activities are needed to address potential user conflicts. Other emerging micromobility technologies that do not fit into the e-bike classification framework may necessitate additional regulatory clarification.

High Bridge Trail State Park in central Virginia is a destination for cyclists using e-bikes and traditional bicycles. Image courtesy of Virginia Department of Conservation and Recreation.

Develop and implement signage and an educational and information campaign for trail users and other interested parties. DCR will continue conducting outreach to visitors about trail etiquette.

Other Noteworthy Practices

Several other State, local, and regional park agencies in Virginia regulate e-bike use on trails and paths consistent with the State's 3-tier e-bike law, with some examples provided below:

Jurisdiction	Summary of E-bike Regulations
Roanoke	The city allows all classes of e-bikes on all paved greenways and natural surface trails but continues to prohibit electric scooters and electric skateboards on these facilities. The rule was informed by a public hearing, concerns about the enforceability of regulating different e-bike classes differently, and a desire for increased accessibility of park amenities to all users.
NOVA Parks	The regional park authority in northern Virginia allows all classes of e-bikes where traditional bicycles are allowed. The authority publishes trail etiquette guidelines encouraging e-bike riders to not exceed 20 miles per hour.
Virginia Department of Transportation	The State DOT allows all classes of e-bikes on shared use paths.

Key Takeaways

DCR's e-bike policy is expanding access to outdoor recreational opportunities in the State. The policy's implementation highlights takeaways for other jurisdictions interested in standing up similar initiatives.

Coordination among Federal, State, regional, and local partners can ensure e-bike policies are harmonized and clearly communicated to visitors. The next update to the Virginia Outdoor Plan, the State's comprehensive plan for land conservation, outdoor recreation, and open space planning, may provide opportunities to integrate e-bike considerations into coordinated interagency planning efforts.

Recreational trail managers can advance safety and accessibility goals by establishing e-bike policies before e-bikes become more commonplace on public lands, proactively avoiding visitor confusion and potential for user conflict.

U.S. Department of Transportation
Federal Highway Administration

FHWA E-bike Case Study Series

FHWA-HEP-23-031

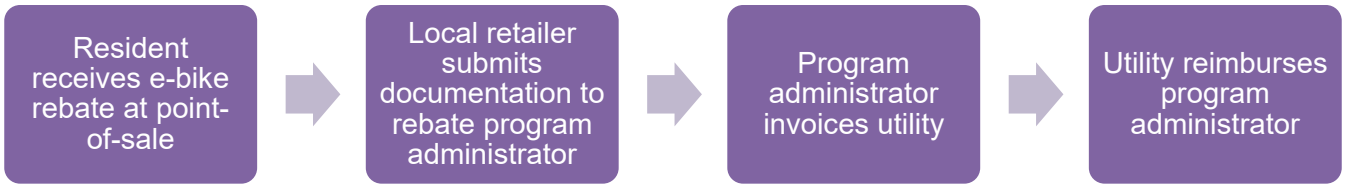
Energy Utilities Provide E-bike Purchase Rebates in Vermont

Vermont's Renewable Energy Standard supports the State of Vermont's goals to develop markets for renewable energy and reduce environmental impacts associated with conventional energy production. To comply with the standard, electric distribution utilities in the State may implement "energy transformation projects" that reduce fossil fuel consumption and greenhouse gas emissions by the utilities' customers. Electric utilities have developed electric bicycle (e-bike) incentive programs as one type of energy transformation project to comply with the standard.

This case study focuses on the Burlington Electric Department (BED), Vermont's largest municipally owned electric utility, which serves about 20,000 customers in the city of Burlington and the Burlington International Airport.[1]

Program Overview

BED's e-bike rebate program, launched in 2017, offers current Burlington residents or those purchasing on behalf of a Burlington business a $200 rebate for a new e-bike or a retrofit/conversion kit, redeemable at seven participating retailers. The program is administered by Local Motion, an organization advocating for active transportation. The program operates through the process illustrated below:



[1] Burlington Electric Department, Our History.

A majority of Burlington residents are renters, so to reach more people, program eligibility is based on residency rather than status as a utility customer. Working with local bicycle retailers was important to promote investment in the local economy and incentivize the purchase of e-bikes that could be serviced locally. Rebates also help level the playing field for local shops, making them more competitive with online sellers. Per Vermont's Renewable Energy Standard, the rebate value is capped based on the anticipated fossil fuel displacement associated with increased e-bike usage.

Partnerships

E-bike rebates are one initiative in a constellation of related programs that improve Vermonters' access to e-bikes. To support the efficacy of the e-bike rebate program, BED has also:

- Funded an e-bike ***lending library*** operated by Local Motion. Through the library, Burlington residents considering purchasing their own e-bike or cargo e-bike can borrow one for several days at no cost to see how it fits into their lifestyle.
- Partnered with CarShare Vermont to provide an additional incentive for e-bike purchases by offering e-bike purchasers one year of free membership in the ***carshare*** program.
- Coordinated with VBike, a nonprofit that focuses on new bike technology and design, which offers free bike ***consultations*** funded by Go Vermont, the State's alternative transportation program. The consultations help Vermonters find the right e-bike or cargo e-bike for their transportation needs.

A cargo e-bike available through the lending library partnership. Image courtesy of Local Motion.

One local retailer participating in the program is the nonprofit bicycle shop Old Spokes Home, which works to improve access to bicycles for all income levels. To make e-bikes more affordable to low-income individuals, the organization offers no-interest loans that do not require a down payment and sells e-bikes at cost.

The Vermont State Employees Credit Union (VSECU) offers low-interest energy improvement loans that can be used for various energy efficiency and energy saving purchases, including purchasing e-bikes. BED has partnered with VSECU to offer zero percent financing for e-bikes.

Impact

The program has issued a total of 181 rebates since its inception, with 52 issued in 2020. Across Vermont, similar programs run through other electric utilities have provided approximately 700 rebates in 2020. BED estimates that the program has reduced carbon dioxide emission by approximately 701 tons. More intangibly, the program and others like it are helping to cultivate excitement around bicycling, expand access to bicycling to more people who cannot or choose not to use conventional bicycles, and create a constituency advocating for improved bicycling infrastructure across the State.

Noteworthy Practices

Several other utilities in Vermont offer similar e-bike rebate programs, described below:

Utility	Rebate Value	Rebate Details
Green Mountain Power (GMP)	$200	• Point-of-sale rebate • Redeemable by customers • Redeemable at 36 participating retailers • Valid for e-bikes or retrofits costing at least $500 (pre-tax) and that are intended for customer use and to replace car trips (not just recreational) • GMP offered a $300 rebate in April 2020 due to the COVID-19 pandemic, and saw a tripling in the number of rebates redeemed in 2020 relative to 2019
Vermont Public Power Supply Authority (VPPSA)	$100	• Mail-in rebate • Redeemable by customers • Redeemable at any Vermont-based retailer • Valid for e-bikes or retrofits
Washington Electric Cooperative (WEC)	$200 or 50 percent of purchase price	• Mail-in rebate • Redeemable by customers • Redeemable at any Vermont retailer • Valid for new e-bikes

Key Takeaways

BED's rebate program is expanding access to and increasing the number of e-bikes in Burlington. The program's implementation highlights a few takeaways for other jurisdictions interested in standing up similar initiatives.

An e-bike rebate is only one way to reduce single occupancy vehicle use. Cyclists, whether using e-bikes or traditional bicycles, need safe infrastructure to reduce barriers to bicycling. To meet commuting needs year round, e-bike users and conventional bicyclists should consider accessories (e.g., snow tires, panniers, and fenders). Vermont bicyclists are also required by State law to use a front light and rear reflector.

Education and outreach are critical to ensure people understand the benefits of bicycling, the viability of replacing car trips with e-bike and cargo e-bike trips, and programs available to support increased access to e-bikes. BED and its partner organizations conducted outreach through consultations, carshare promotions, and operation of a lending library.

Consideration of equity is important, given the high upfront cost of purchasing an e-bike. For example, some low-income people are uncomfortable working with conventional banks to access financing for traditional bicycles and e-bikes, so retailers are working to identify other options. In addition, some renters lack access to secure storage for e-bikes. Utilities like BED are working with partner organizations to reduce barriers to e-bike ownership and use, including offering zero percent financing through a local credit union.

U.S.Department of Transportation
Federal Highway Administration

FHWA's Livable Communities Case Study Series

FHWA-HEP-19-008

Promoting Access and Innovation with Dockless Bike Share in Seattle, WA

Challenge

The city of Seattle, Washington is the largest city in the state with a population of nearly 725,000 people. Despite the city's rainy climate and hilly topography, as of 2015 approximately four percent of the population regularly commuted to work by bicycle, which ranks fifth among large cities in the United States. Following the closure of the *Pronto!* docked bike share system in March of 2017, Seattle was left as the only large city in the United States without a bike share system. Bike sharing is rapidly growing and evolving nationwide, and provides a way to expand access to bicycling, as well as connections to transit. Without the necessary public funding and political will to revisit bike sharing, the loss of *Pronto!* left a void in Seattle's transportation system. In the months following the shuttering of the docked bike share system, city officials began to explore dockless bike share, which was just beginning to take hold in the country.

Solution

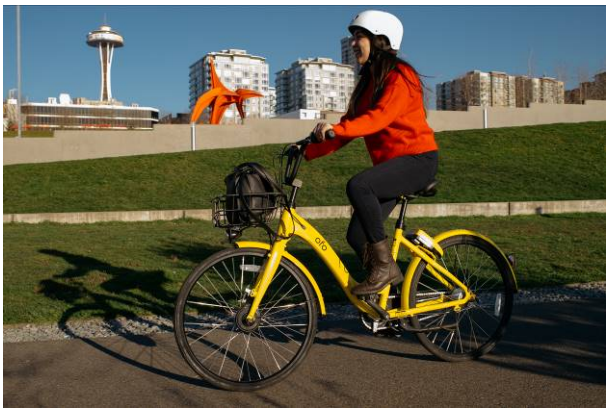
In July of 2017, the Seattle Department of Transportation (SDOT) formally adopted citywide dockless bike share. Through a comprehensive application process, SDOT welcomed three private operators and a scalable bicycle fleet model that started with fewer than 1,000 bicycles, before growing to nearly 10,000 bicycles on Seattle's streets by the end of the pilot. Traditional bike share systems operate with permanent docks located throughout the system's operating area, where all trips must start and finish. The model has proven to be effective across the country, but requires significant public investments in costly docks and bicycles to get the system up and running. On the other hand, dockless bike share systems allow users to unlock bicycles with a smartphone app and drop them off where they wish whether that be at a bike rack, in a park, or on the sidewalk. These systems are privately funded, providing an opportunity to expand mobility options at no cost to taxpayers. While various cities across the country were considering adding dockless bike share systems at the time, SDOT was the first agency to embrace the innovation head on and begin a pilot program at scale.

Three types of dockless bikes in Seattle. Image courtesy City of Seattle.

In order to prepare the city for the dockless approach, SDOT worked with stakeholders to develop an extensive permit, which addressed issues related to safety, parking, operations, fees, and data sharing. An early priority was to ensure that each operator would provide the city with anonymized data for each trip taken on a dockless bicycle to provide insight into how the bicycles were being used and to inform future policy recommendations.

Over the initial 6-month pilot period from July to December 2017, there were approximately 469,000 rides taken on dockless bicycles throughout Seattle, nearly 10 times the number of rides on the docked system during the same period in 2016. Approximately 75 percent of users reported taking bike share to access transit and 33 percent regularly accessed transit with bike share. By providing easy and convenient first- and last-mile connections to transit, the dockless bike share system demonstrated its ability to augment and improve Seattle's public transportation network rather than supplanting it.

During the pilot program, SDOT designed and administered two surveys – a statistically valid citywide survey of both users and non-users, and a company issued user survey – in order to learn how the public was using the bicycles and gauge public sentiment toward the model as a whole. The surveys found that 75 percent of residents viewed the bike share program favorably and that the system enhanced mobility options in traditionally underserved areas.



Dockless bicycle user in Seattle. Image courtesy City of Seattle.

Despite these improvements, SDOT continues to receive complaints, primarily related to improperly parked bicycles and safety-related concerns. The flexibility inherent in the system that allows bicycles to be parked anywhere has the potential to create more obstacles, if the bikes block access to curb ramps, loading zones, and sidewalks. SDOT has begun to update the permitting process, which will include a focus on bicycle parking and improving access for the unbanked population and those without smartphones. SDOT also plans to incorporate flexibility in the permit to accommodate mid-year changes and continuous evaluation and learning. This approach will preserve opportunities for private sector innovation, while ensuring that the outcomes meet the public's best interests.

Conclusion

Moving forward, Seattle expects to expand dockless bike share through a new permit approved in August of 2018 that will allow up to 20,000 bicycles on the streets, from four private operators. The major expansion demonstrates the success of the pilot and an increased interest in and commitment to improving multi-modal transportation options. In the coming years, SDOT will use the fees collected from the private operators to address potential safety-related externalities from the program by creating designated parking areas throughout the city to ensure that visually- and mobility-impaired populations can easily navigate the streets. The city will also take steps to ensure that the unbanked and individuals without smartphones may access the system.

Through the new permitting process, SDOT is also increasing its commitment to invest in bicycle infrastructure. Using a range of funds including the Move Seattle Levy, the city will work with stakeholders to complete several bicycle infrastructure projects to strengthen Seattle's bicycle network. SDOT is also in the process of updating its bicycle master plan to incorporate bike share and e-scooters to its overall network.

With a rapidly changing industry, it is critical for cities to determine their goals and approach to "new mobility" options. SDOT's ability to promote the use of technology and data in transportation, while leveraging support and funding from the private sector directly aligns with the Federal Highway Administration's priorities. Seattle's experience demonstrates how innovations such as dockless bike share present an opportunity for cities to further promote livability by expanding options and improving connectivity for all users.

U.S.Department of Transportation
Federal Highway Administration

FHWA's Livable Communities Case Study Series

FHWA-HEP-20-042

Improving Access and Safety for Shared Micromobility Users in Santa Monica, CA

Challenge

Santa Monica is a coastal city west of downtown Los Angeles with a population of roughly 91,000 people. The city is a leader in sustainable mobility, having been the first in Los Angeles County to launch a municipally-owned and operated bicycle share system in 2015, called Breeze Bike Share. Shared micromobility devices such as bicycles, electric bicycles (e-bicycles), and electric scooters (e-scooters) create a more diverse, convenient, and accessible transportation network that can provide more transportation options, reduce congestion, and improve quality of life.

E-scooters users in a designated lane. Image courtesy of the city of Santa Monica.

In 2018, private e-scooter companies began operating with unsanctioned e-scooters in Santa Monica and the city needed to quickly determine how to best react to this development. After weighing their options, the city of Santa Monica approved a 16-month Shared Mobility Pilot Program allowing four private companies (Bird, Jump, Lime, and Lyft) to provide shared mobility services, including e-scooters and e-bicycles, under new city regulations. The city selected the Shared Mobility Pilot Program participating operators through a rigorous selection process, which included a public comment period.

Solution

The Shared Mobility Services Pilot allowed participating companies to deploy a set number of devices within the designated ridership area in Santa Monica. The Pilot program enabled the city to:

- Develop and refine a new area of policy, regulation, and enforcement through firsthand experience;
- Move quickly to adapt to a rapidly changing industry, while leaving room to learn and adjust as appropriate;
- Test new device and service providers in a growing industry;
- Explore partnership models with private companies;
- Explore possibilities for data capture, structures, and utilization; and
- Experiment with different management tools, such as geofencing and designated drop zones.

E-scooters parked in a designated drop zone. Image courtesy of the city of Santa Monica.

The Pilot enabled flexibility and collaboration with the participating companies. Companies had the option to request an increase in their allowable fleets, which the city evaluated based on market need, the number of devices deployed in the city, device utilization, operator performance, public safety metrics, seasonal and environmental conditions, device maintenance, and special circumstances, such as large events. The city also set minimum requirements, such as geofencing on the devices, operation of a 24/7 customer service line, and a maximum response time of two hours for public safety concerns, such as devices blocking the right-of-way (ROW). The city designed the regulations such that they could be revised during the Pilot time period as circumstances and technologies evolve. For example, geofencing on devices was encouraged rather than required at the start of the Pilot; upon further development of the technology, geofencing became a minimum requirement. Santa Monica's current administrative regulations for micromobility were updated in April 2019 and included revisions regarding incentives for use of Shared Mobility Drop Zones, enhanced outreach and education efforts required by shared mobility device operators, and a new reduced speed for devices operating within designated zones in order to increase safety.

Additionally, the city strengthened administrative language surrounding equitable access to these devices. For example, device operators must establish and promote low-income qualified rates for shared mobility device use, and offer incentives (such as education, outreach, and payment plans) for low-income or other disadvantaged users. The regulations require device operators to distribute two thirds of their fleet outside of downtown Santa Monica, with the intent of incentivizing a more equitable distribution of devices in underserved communities. The regulations also strongly encourage operators to provide a system for user sign-up and payment enabling easy use of the reduced rates via methods that do not require a smartphone and/or access to a credit or debit card. The city used internal resources to develop and launch the Pilot, and later implemented cost recovery via a fee structure for micromobility operators. The fee recovery included annual operation fees (a lump sum from each operator, along with an individual fee per year per device); an infrastructure fee for upkeep of the ROW ($1/device/day); and citation fees based on unlawful operation. The city used these fees to hire dedicated staff for the administration and enforcement of the Pilot, and to invest in dedicated infrastructure, such as separated lanes.

Santa Monica adopted Mobility Data Specifications (MDS) from Los Angeles County (now overseen by the Open Mobility Foundation) to collect, clean, and analyze micromobility data. The MDS are open-source and available in real-time, which are used by cities to enforce, evaluate, and actively manage private companies operating in a public space. Santa Monica aggregated volumes from millions of micromobility trips to identify opportunities for new protected lanes, designated drop zones, and other infrastructure. The community responded positively to the shared micromobility devices after the Pilot's launch. Eleven months into the Pilot, the city released a Shared Mobility Community Survey to better understand user demographics; rider behavior; whether shared mobility trips displaced trips by other modes; and the familiarity of users with the rules of riding shared mobility devices. Initial results from 4,260 self-selected respondents show users took shared mobility trips for a wide range of purposes, with work trips

reported as the most common. Respondents reported that 50 percent of their most recent shared mobility trips displaced a car trip (including driving alone, ride-hailing services, taxi, etc.) and decreased their use of motor vehicles overall. Compared to other modes, respondents reported a notable increase in walking and rail transit use (18 percent and 16 percent, respectively) since using shared micromobility devices. The city also published a Shared Mobility Pilot Program Summary Report in late 2019, which outlines lessons learned and recommendations for future programming. Opportunities for future work include public ROW management; rider behavior; equity and access; device design and maintenance; and fleet management. In November 2019 the Santa Monica City Council voted to extend the Pilot through spring 2020. The extension aimed to pave the way for a second pilot program with revised regulations facilitating greater customer reliability and affordability, and more effectively achieving safety outcomes.

Conclusion

The cultural shift among Santa Monica residents and visitors to sustainable modes like shared micromobility is a long-term challenge with no quick solutions. To address user education and safety challenges, the city deployed public education and signage around micromobility safety, released a video focused on safe e-scooter use, and created designated no-ride zones, such as the Santa Monica Pier. The city also formed the Shared Mobility Community Advisory Committee, made up of mobility advocates, subject-matter experts, and residents to examine challenges and provide suggestions to improve the Pilot program. Maintaining equitable access to the public ROW for all users also presented a challenge. Santa Monica created shared mobility parking zones, shown on an interactive map, to keep shared micromobility devices off sidewalks and personal property when not in use. The agreements with device operators also allowed the city to cite and impound unauthorized or unlawfully operated devices.

Signage designating mobility device dismount zones. Image courtesy of the city of Santa Monica.

Micromobility devices, even when well managed, can also present unexpected challenges. In April and May of 2020, Lime and Jump discontinued operations in Santa Monica due to uncertainty caused by COVID-19. Similarly, the Breeze Bike Share service will cease operations in November 2020. To mitigate discontinued operations, City Council voted on May 26, 2020 to extend the first Pilot Program through April 30, 2021, and postponed a previously approved second shared mobility pilot program with revised regulations until May 2021. In order to continue providing the public with reliable and safe transportation options for essential trips, Bird and Lyft are continuing to provide services through April 2021. City staff intend to return to Council in spring 2021 with recommended next steps.

In hindsight, the city believes their solicitation and evaluation approach to micromobility was more effective than ad hoc permitting. Soliciting specific proposals from micromobility operators enabled the city to not only receive more detailed data and information on the operation of the devices from the outset, but also enabled a framework for operation and a regulatory environment prioritizing the safety of all roadway users. As Santa Monica evaluates ways to improve emerging modes of shared micromobility, the city will continue to work towards enhancing access, safety, and stakeholder engagement around micromobility. Based on its experience through the Pilot process, the city suggests that other municipalities approaching this topic establish clear rules of engagement, maintain communications regarding evolving regulations within municipal departments and the public, and focus on building collaborative relationships with the private industry micromobility operators from the outset.

Content originally published in January 2020 and updated in August 2020

Shared Micromobility Pilot Promotes Low-Income Access in Fort Smith, Arkansas

Challenge

Fort Smith is a city in Northwest Arkansas with a population of approximately 90,000 people. The median household income of Fort Smith is below the national average, with a poverty rate of 18.9 percent in 2021.[1] Roughly 65 percent of low-income residents in Fort Smith do not own a personal vehicle or have access to reliable public transportation.[2] Most routes in Fort Smith's public transportation network only run hourly from 7am to 6pm, 6 days a week, making it difficult for low-income residents to rely on public transportation for consistent and timely trips to and from home, work, medical providers, and other essential destinations. This is particularly true for commuting trips outside of typical morning and evening service.

Shared micromobility is emerging in larger cities across the country as a viable transportation mode to address the first- and last-mile challenge, helping to connect individuals to public transit and other transportation options. However, the benefits of shared micromobility may not be equitably shared across all communities and abilities. Because growth of shared micromobility is often dependent on private investment and the availability of high-quality active transportation infrastructure, its development has been concentrated in large, urban areas. Furthermore, some low-income populations may face barriers to accessing shared micromobility for a number of reasons, including:

- Lack of outreach to and engagement with underserved and disadvantaged populations in planning shared mobility systems;
- Lack of safe, micromobility-friendly infrastructure throughout the operation area;
- Lack of safe, accessible infrastructure and/or transit accessibility at and beyond the operation area boundary to further extend network reach;
- Lack of pricing structure affordability;
- Lack of access to payment and trip options for unbanked individuals and individuals without a smartphone;
- Lack of availability of adaptive devices for people with disabilities;
- Inequitable distribution of devices across the network; and
- Inequitable enforcement.

Bicycle docked at bikeshare station. Image source: University of Arkansas

Solution

In early 2021, the National Science Foundation (NSF) awarded the University of Arkansas (U of A) a $50,000 grant as part of the CIVIC Innovation Challenge, which is co-funded by the U.S. Departments of Energy and Homeland Security. This planning study, "A Community-Based Framework to Develop Shared Micromobility for

[1] *U.S. Census Bureau*
[2] *University of Arkansas*, $1.2 Million NSF Grant to Deploy Micromobility Services in Low-Income Neighborhoods

Affordable-Accessible Housing (SMILIES)," sought to improve access to jobs and essential activities for affordable housing communities in small- and mid-sized cities and rural areas by leveraging the explosive growth of shared micromobility.

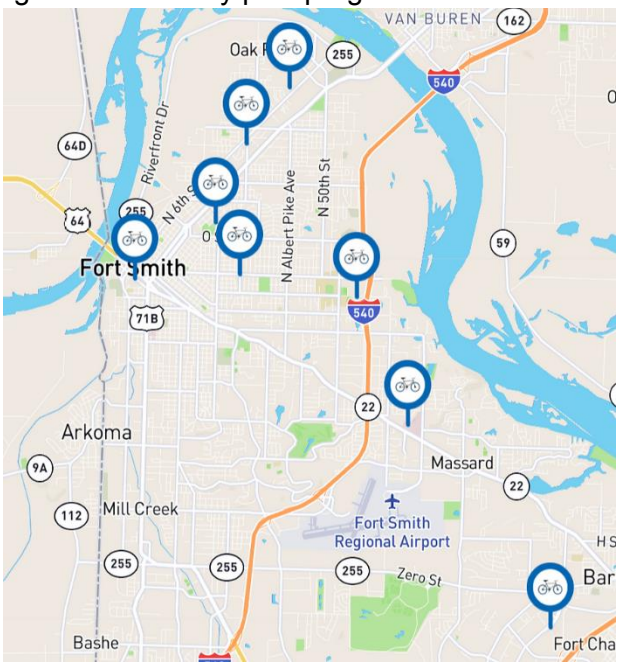
This initial planning grant created the opportunity for researchers to study weak transportation links in the city. University of Arkansas worked with Frontier Metropolitan Planning Organization (FMPO) to conduct community engagement activities, including virtual public meetings and an open house. Public involvement efforts relied on QR codes and social media to encourage the public to respond to surveys about transportation needs through FMPO's input platform. The team also held one-on-one meetings with stakeholder organizations and developed a community-based participatory action group to involve local residents in the decision-making process.

The community transportation needs assessment survey conducted through the planning grant found that more than 50 percent of respondents reported challenges accessing transportation services to travel to workplaces every day in Fort Smith. For lower-income populations with annual household incomes of less than $34,000, this rose to 65 percent, with many reporting that they do not own a car or are challenged by limited public transportation options. Further, many of these communities are considered food deserts[3], and residents also have limited access to education and healthcare. Accessing grocery stores, schools, and medical facilities are transportation intensive activities. Moreover, the survey found that more than 70 percent of low-income people—more than 50 percent of the overall population—were interested in using shared micromobility in Fort Smith.

Results from the planning grant were foundational for U of A's successful proposal for an additional $1.2 million pilot implementation grant also through the CIVIC Innovation Challenge, which was awarded in September 2021. The additional grant award focused on creating and funding a micromobility pilot program for residents in Fort Smith from early 2022 to late 2024.

In 2022, the research team initiated a bikeshare pilot with 40 bikes (20 electric bicycles (e-bikes) and 20 traditional bicycles) in four neighborhoods, including three low-income neighborhoods (with a total of six stations) and one affluent neighborhood (with two stations). The goal of the pilot is to determine a long-term pricing strategy and sources of funding to help the city to sustain the program going forward. The pilot is testing various payment options including cash and prepaid cards to overcome barriers to access for low-income communities.[4]

The researchers determined bikeshare station placement in all four neighborhoods through a community input process. In the three low-income neighborhoods, community input influenced the team's decision to place bikeshare stations at key community locations, including markets, community centers, housing complexes, and workplaces with non-



Initial locations of the bikeshare stations in Fort Smith. Image source: Tandem Mobility

[3] *USDA*, Food Access Research Atlas
[4] *Better Bikeshare Partnership*, Researchers in Arkansas Are Redesigning Bike Share

traditional hours.[5] Evaluating the performance of the stations for about nine months, the researchers rearranged station placement in low-income neighborhoods after further consultation with the community and local leaders.

Complementary infrastructure projects are planned in Fort Smith, including improvements to existing riverfront trails and bike lanes. The Arkansas College of Health is also developing a mobile application for individuals to identify infrastructure deficiencies and provide feedback directly to the city. The application will be able to geospatially locate areas for improvement, filling a current gap in information.

FMPO and Fort Smith are conducting public engagement to inform development of an active transportation plan, *Move Fort Smith*, which will guide improvements to the city's active transportation infrastructure and thus improve comfort, safety, and access for people biking, walking, and rolling, including for shared micromobility users.

Conclusion

Shared micromobility is expanding beyond larger cities and growing in smaller and rural communities. Research and pilot programs, including this example in Fort Smith, are helping to ensure that there is equitable access to essential destinations for all residents regardless of income. As of May 2024, the Fort Smith bikeshare pilot is ongoing, and the data cited in this case study are based on the information available at the time of publication. The U of A researchers found through their trip end survey that 60 percent of bikeshare trips taken were by low-income riders, illustrating the pilot's success in mobilizing low-income residents of Fort Smith. Despite challenges such as the COVID-19 pandemic, safety concerns due to lack of active transportation infrastructure, and low participation during colder winter months, in December 2022 the city added new e-bikes to the system. As of April 2024, the system has logged over 12,000 miles from more than 1,600 users since its inception in May 2022.[6] Moreover, the program supports reduction in greenhouse gas emissions, as 36 percent of surveyed users indicated that their bikeshare trips would have been otherwise taken in a personal vehicle.[7]

Equitable shared micromobility projects such as this can be scaled and replicated in other mid-size cities across the country. E-bike sharing programs are likely eligible for funding under several DOT surface transportation funding programs. Allowable costs may include capital and equipment expenditures, education and encouragement activities related to safe access for bicyclists, and data collection and monitoring for bicyclists.

Additional FHWA Resources

- *Micromobility*
- *E-Bike Resources*
- *Bicycle and Pedestrian Program*
- *Bicycle and Pedestrian Funding Opportunities*
- *Bicycle and Pedestrian Program Guidance*
- *Technical Assistance Resources for Active Transportation*

[5] *National Center for Mobility Management*, Fort Smith Pilot Redesigns Shared Micromobility Services for Low-Income Residents

[6] *Tableau Public*, Ride 4 Smilies Dashboard

[7] *Northwest Arkansas Regional Planning Commission*, Northwest Arkansas Priority Action Plan Supplement