



Zero Emission Transition Plan

Champaign-Urbana Mass Transit District

Updated: March 2023

I. Introduction

The Champaign-Urbana Mass Transit District (MTD) has prepared this Zero Emission Transition Plan with assistance from the Center for Transportation and the Environment (CTE). This is a long-term fleet and infrastructure management plan that considers cost, availability of resources, policy and legislation, existing and future facilities, existing and future partnerships, and workforce impact. This plan is a forecast based on the information currently available. MTD anticipates updating this plan as more information becomes available.

II. Fleet Assessment

Buses

MTD purchased its first diesel-electric hybrid buses in 2009 after the Board of Trustees committed to ending all future purchases of standard diesel buses. Our fleet has now grown to the highest percentage of hybrid buses in the country.

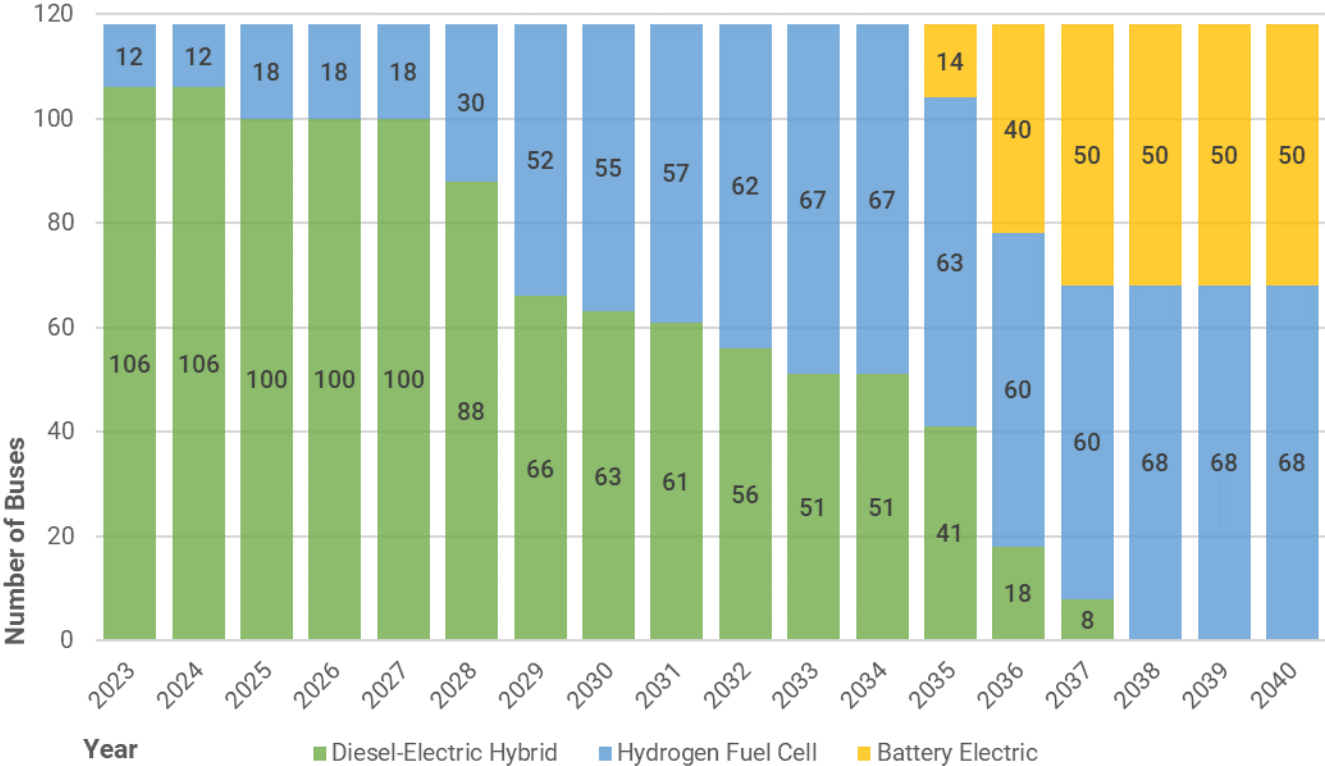
MTD began its pursuit of zero emission buses in 2017. Fuel cell electric buses (FCEB) align with the MTD's commitment to environmental responsibility while maintaining our commitment to providing service to our passengers. MTD was awarded funding through the Federal Transportation Administration (FTA) for the first phase of our FCEB deployment. Additional federal and state grant funding was secured to complete the project.

In 2021, MTD introduced the first zero emission buses to the fleet with the deployment of two 60-foot FCEBs. The first phase our FCEB deployment includes three components to make the technology truly zero emissions: a solar array to produce clean energy, a hydrogen fuel production station that uses solar energy to turn water into hydrogen, and FCEBs that use hydrogen to generate electric power. MTD is the first transit agency in the nation with a hydrogen fleet fueled entirely from our own 100 percent renewable source. MTD has built an array of nearly 5,500 solar panels to generate clean, renewable energy to power our hydrogen fuel production station, thanks to a partnership with our neighbors at the Urbana-Champaign Sanitary District. Any leftover energy created by the solar array are sold back to the grid as clean energy for our community to use. The first phase of the hydrogen station (and the accompanying solar array) is built to accommodate 12 to 15 FCEBs.

As of March 2023, MTD has a total of 118 buses in its fleet, including 40- and 60-foot buses. The fleet is currently 98 percent diesel-electric hybrid and 2 percent FCEBs. By the end of 2023, MTD will have added 10 more FCEBs to the fleet, making it 90 percent diesel-electric hybrid and 10 percent FCEBs. MTD intends to expand the hydrogen fuel production station and continue to expand the FCEB fleet near the capacity of that expansion, approximately 60-80 buses or 50-70 percent of the fleet.

As part of the transition to a fully zero-emission fleet, 2026 will be the last year the District purchases diesel-electric hybrid buses. With this timeline, the district anticipates retiring the last diesel-electric hybrid bus in 2037 and becoming a fully zero-emission bus fleet in 2038. The District intends to delay the introduction of battery electric buses until 2035 to minimize the number of years the maintenance department will need to maintain three different types of fueling technology. Waiting until 2035 will provide more time for the District’s maintenance department to become more proficient with FCEB technology and it will also provide more time for the battery electric technology to be optimized for transit applications. The anticipated future composition of MTD’s fleet by fuel type is shown in Figure 1.

Figure 1: Bus Fleet Composition

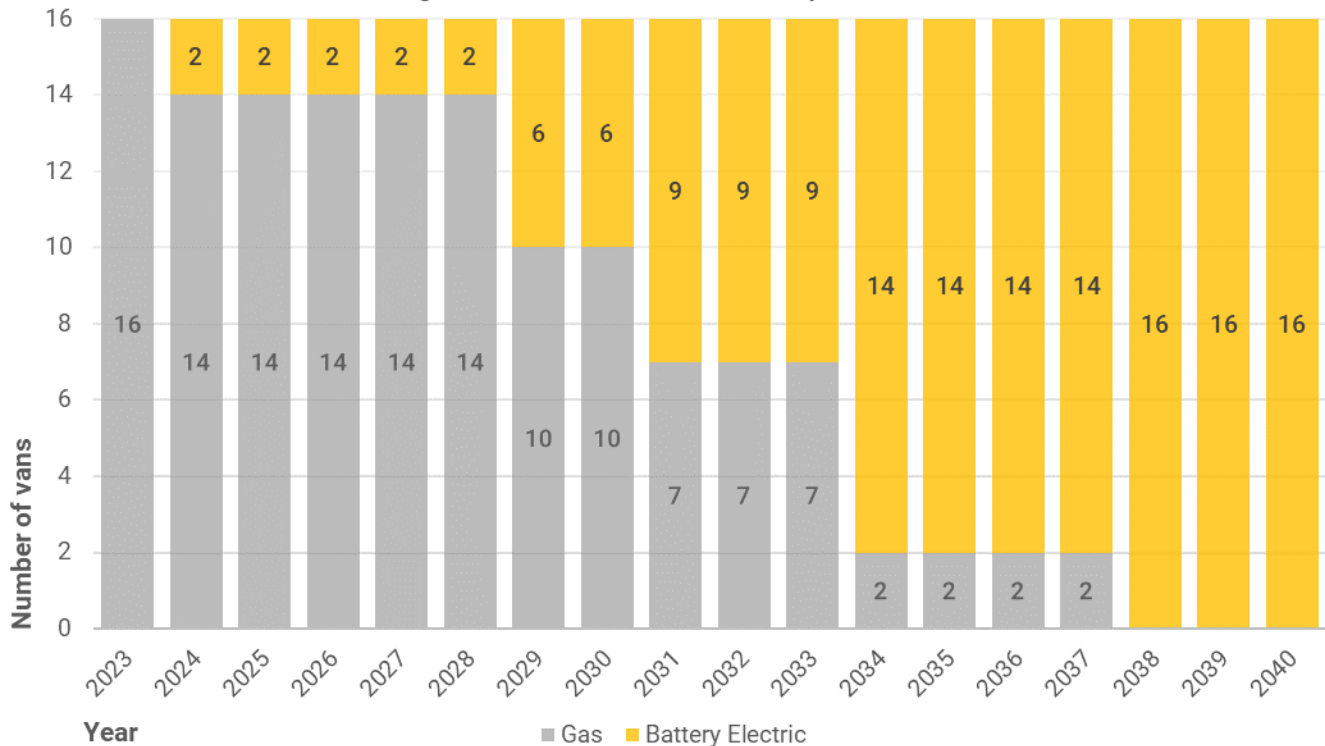


Previously, MTD investigated the possibility of procuring renewable natural gas buses and working with the Urbana Champaign Sanitary District to obtain RNG for fuel. A series of meetings revealed that an RNG partnership wouldn’t be feasible for either party due to infrastructure limitations and the sanitary district’s competing need for RNG.

Paratransit Vans

MTD also has 14 gasoline fueled vans used for paratransit services. Two more vans, also gasoline fueled, will be added to the fleet by July 2023 for a total of 16 vans. The zero-emission transition plan for MTD’s paratransit vans is to incorporate battery electric vans and related charging infrastructure using a measured approach until the van fleet is made up of 100 percent zero-emission battery electric vehicles in 2038. With this timeline, the district anticipates retiring the last gasoline fueled paratransit van in 2037. MTD has utilized hybrid technology for paratransit vans in the past without success. Given the proliferation of battery electric vehicle technology in the past several years, the District is optimistic about the incorporation of battery electric technology, starting slowly with the van fleet before incorporating battery electric technology into the bus fleet. MTD is part of an Illinois Department of Transportation application for federal funding for a battery-electric van pilot program. If awarded, the District would receive our first two battery electric vans in 2024 as a result of this application. The anticipated future composition of MTD’s van fleet by fuel type is shown in Figure 2.

Figure 2: Van Fleet Composition



III. Funding and Facilities Assessment

MTD completed a funding needs assessment to understand the availability of current and future resources to meet the costs for the transition to a fully zero-emission fleet. Estimates are shown in 2023 dollars, no rates of inflation were applied. The annual fleet procurement costs for MTD’s desired fleet mix for both buses and vans are shown in Figures 3 and 4.

Figure 3: Annual Bus Purchases

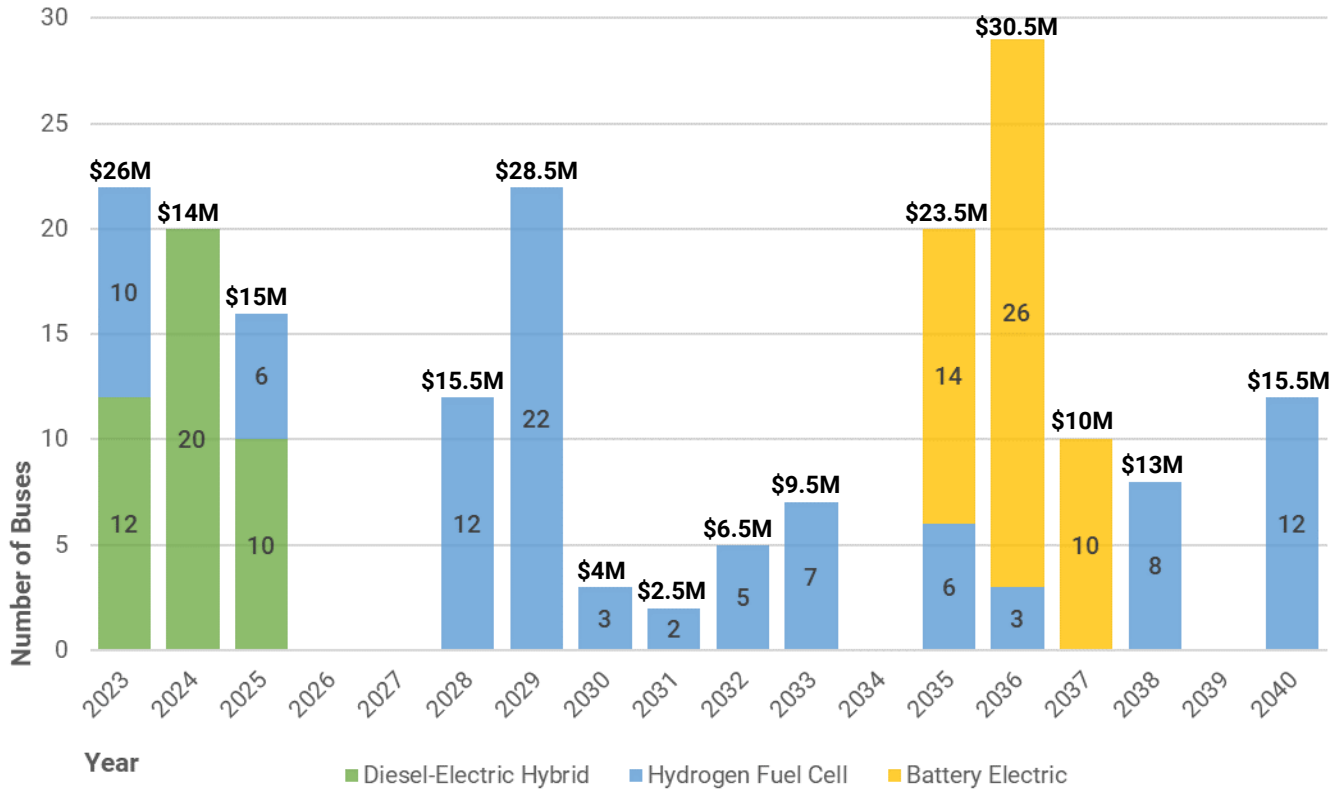
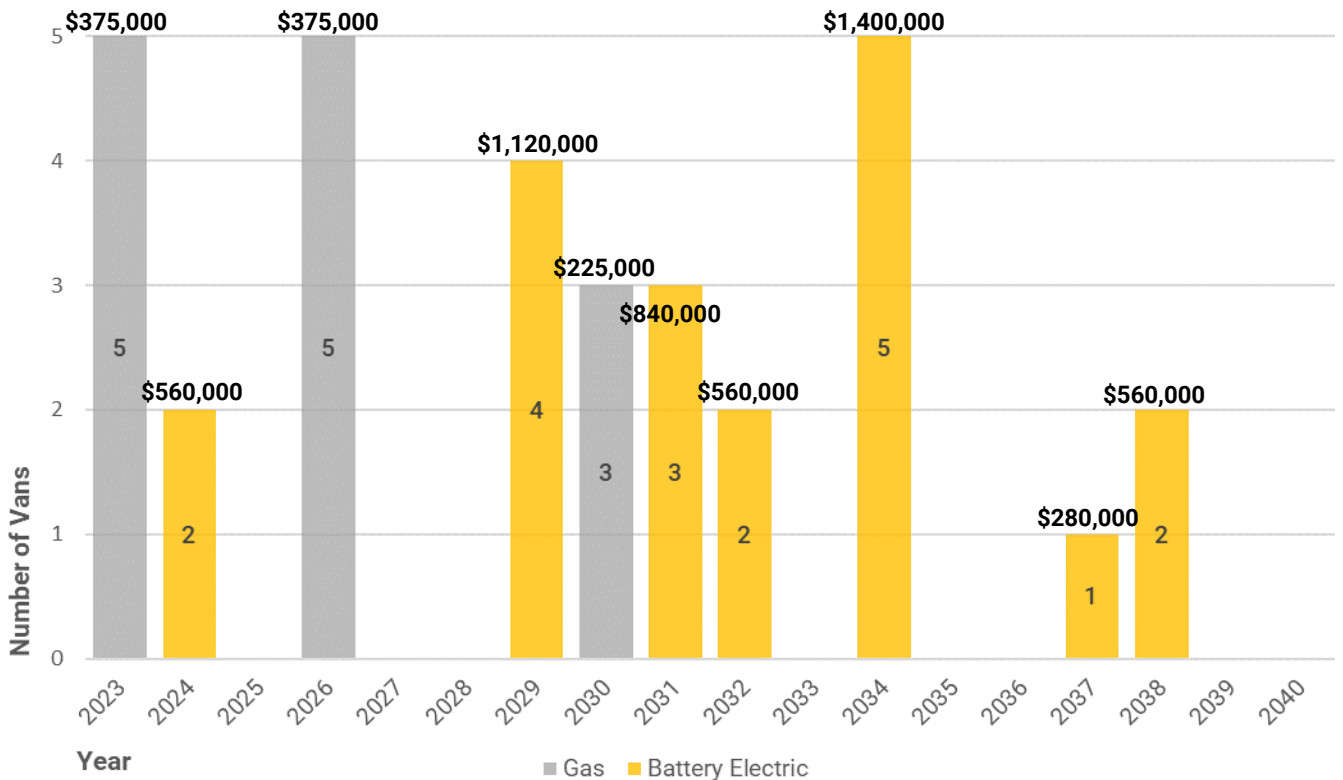


Figure 4: Annual Van Purchases



Hydrogen Fuel Cell Bus Infrastructure

MTD's current facilities are equipped to accommodate FCEBs. In 2020 MTD completed a retrofit of its Maintenance Facility to ensure that the entire facility would be compatible with activities related to maintaining fuel cell electric buses. MTD is planning for a second facility that will accommodate small vehicle storage and upgrades needed to the existing body shop. FCEB and battery electric vehicle accommodations will be included in the plans for the new facility.

MTD has also made an initial investment in hydrogen fueling infrastructure. An electrolysis hydrogen refueling station has been installed on MTD's property. The system can produce up to 420 kg per day, which may support up to 15 buses. The system is powered by a solar array, enabling MTD to fuel their buses with green hydrogen and ensure zero-emissions from well-to-wheel. The station was built with future expansion in mind and MTD plans to expand the current hydrogen refueling infrastructure to accommodate a liquid delivery system that could accommodate approximately 60 additional buses, for a total fueling capacity of 70-80 buses. MTD is requesting approximately \$8.5 million in FTA funding in 2023 to expand the current station and plans to procure this infrastructure as soon as funding is awarded.

Battery Electric Bus and Van Infrastructure

Supporting battery-electric buses will require MTD's maintenance facility to accommodate electrified facilities to park, charge, and maintain buses. These electrified facilities would require space in the current bus storage garage at 803 E University Avenue in Urbana as well as at 1209, 1211, and 1213 E University Avenue in Urbana, a set of properties recently acquired by the district to expand the existing maintenance facility, specifically for van storage and a new body shop. Figures 5 and 6 below provide a general overview of the additional investment in electrification and charging infrastructure that would be required before and during the incorporation of battery electric vehicles into the bus and van fleets. In contrast to the higher up-front cost for FCEB infrastructure, battery electric vehicles require ongoing infrastructure investments with each additional vehicle purchase.



Figure 5: Annual Battery Electric Bus Infrastructure

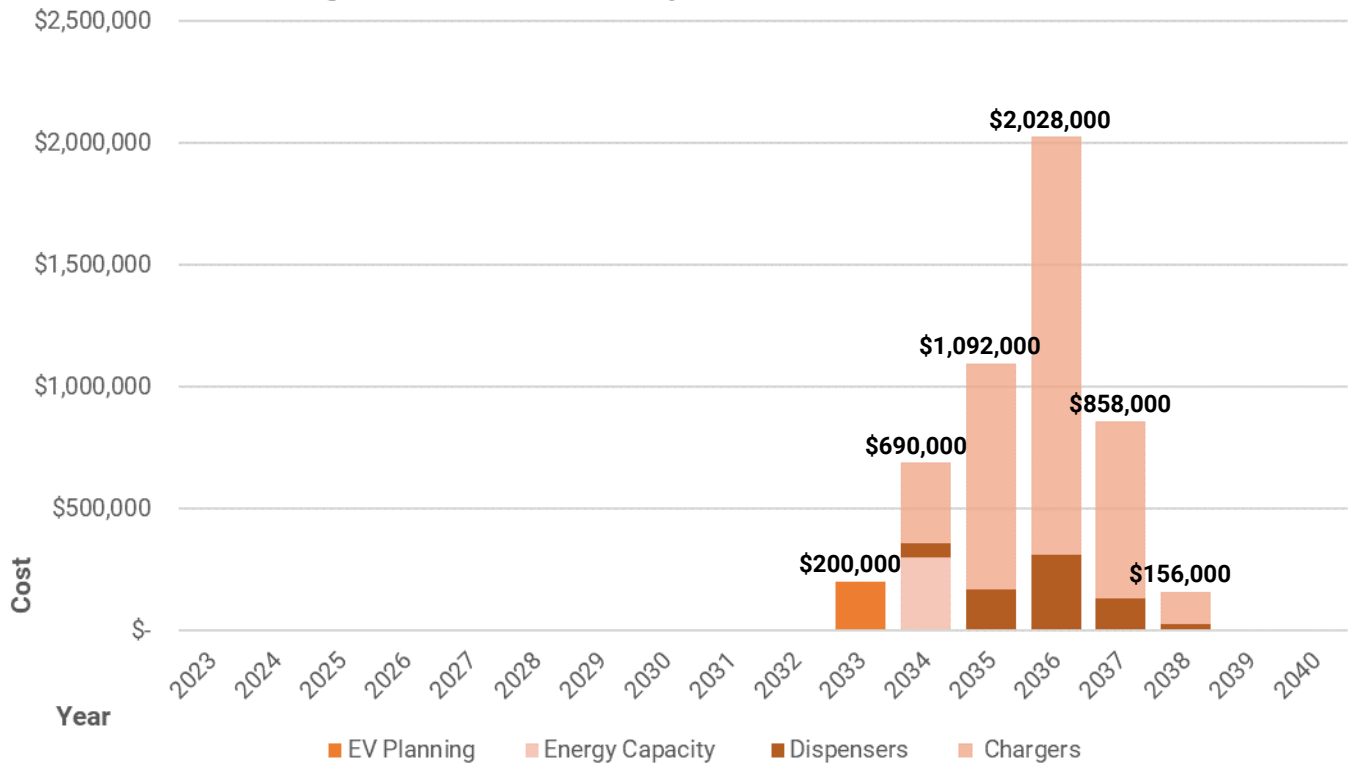
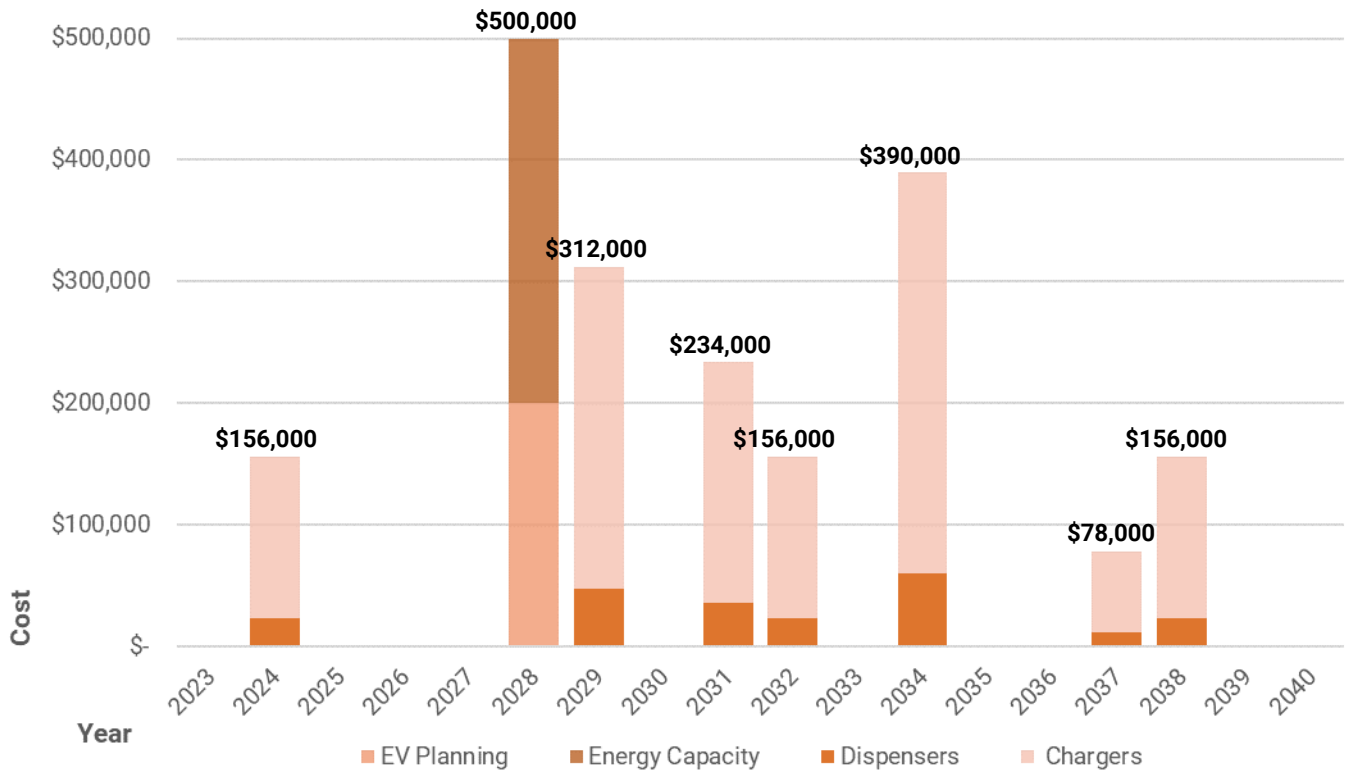


Figure 6: Annual Battery Electric Van Infrastructure



Funding Sources

Potential funding resources for the capital cost of fleet replacements include the following specific funding programs and general sources that do not have specific, known programs but are considered as a potential funding resource.

Specific Programs:

- Urbanized Area Formula Funding - 49 U.S.C 5307
 - o Small Transit Intensive Cities Program (STIC)
- Low or No Emission Vehicle Program - 49 U.S.S 5339 (c)
- Grants for Buses and Bus Facilities Program - 49 U.S.S 5339 (b)
- American Rescue Plan Act of 2021 (ARP)
- Coronavirus Response and Relief Supplemental Appropriations Act of 2021 (CRRSA)

General Sources:

- U.S. Department of Energy
- U.S. Environmental Protection Agency
- Illinois Department of Transportation
- Illinois Environmental Protection Agency

MTD has access to local capital funds to match any federal or state funding received through the following revenue sources.

- Local property taxes
- Farebox revenue, including contracts with the University of Illinois at Urbana-Champaign and local school districts
- Facility leases
- Services including advertising and maintenance agreements

IV. Policy Assessment

MTD has considered policies and legislation impacting hydrogen fuel cell, renewable natural gas, and diesel-electric hybrid technology. MTD did not run into any legislative roadblocks since deploying diesel-electric hybrid buses in 2009 or during the deployment of the first two FCEBs and the hydrogen generation and fueling station in 2021. It is MTD's practice to involve state and local partners when deploying new technology, which has allowed for continued success.

The state of Illinois does not have any policies or legislation that hinder the implementation of this Plan. The following examples of recent state legislation and commitments do not directly and specifically impact public transit vehicles but are expected to have a positive impact on advancing the zero-emission vehicle industry in Illinois and potentially provide funding opportunities.

The Future Energy Jobs Act (2016)

- Requires a minimum of 3,000 megawatts of new solar power and 1,300 megawatts of new wind power to be built in the state by 2030.

- Enacts the state’s first community solar program
- Requires the state’s largest utilities to achieve a 16% - 21% reduction in energy use by 2030
- Devotes funding to training for new energy jobs

Illinois entered into the **U.S. Climate Alliance** (2019), committing to the actions below.

- Implement policies that advance the goals of the Paris Agreement, aiming to reduce GHG emissions by at least 26-28 percent below 2005 levels by 2025.
- Track and report progress to the global community in appropriate settings, including when the world convenes to take stock of the Paris Agreement.
- Accelerate new and existing policies to reduce carbon pollution and promote clean energy deployment at the state and federal level.

The Climate and Equitable Jobs Act (2021)

- Incentives for electrifying public transit, school buses and city-owned vehicles.
- Goal of adopting 1,000,000 electric vehicles (single occupancy) in Illinois by 2030.
- Requires all private coal-fired and oil-fired electric generating units to reach zero emissions by 2030.
- Puts the state on a path to 40% renewable energy by 2030 and 50% by 2040.
- Requires 100% zero-emissions power sector by 2045.

No local policies or legislation will hinder implementation. This Plan supports regional goals and is consistent with the transit priorities identified in the Long Range Transportation Plan, the City of Urbana’s Climate Action Plan, the City of Champaign Sustainability Plan, and the University of Illinois at Urbana-Champaign Climate Action Plan.

This Plan aligns with MTD’s internal policies, including the [Environmental Policy](#) (2011) and [Climate Action Plan](#) (2022). MTD is also certified to the ISO 14001:2015 Standard for Environmental Management Systems, the Illinois Green Business Association, and Gold-Level of APTA’s Sustainability Commitment.

V. Partnership Assessment

MTD has engaged in conversations with local utilities and hydrogen fuel providers while planning its fleet transition. Current partners include:

- Ameren Illinois
- Illinois American Water
- Urbana & Champaign Sanitary District (UCSD)
- Trillium Energy

All utilities were engaged during the build of the hydrogen production and fueling station. Both electrical and water utility upgrades were required as part of the build, and UCSD hosts the solar array powering the station. Phase 1 of the hydrogen station was designed and built by Trillium Energy.

Companies that may serve as potential future partners for refueling infrastructure and/or liquid hydrogen supply include:

- Air Liquide
- Air Products
- Cleancor
- Clean Energy
- First Element Fuel
- Linde
- Messer
- Plug Power
- Trillium Energy

VI. Workforce Analysis

MTD has examined the impact of this Plan on the current workforce. Skill gaps, training needs, and retraining needs of the existing workforce have been identified.

Fuel Cell Training Center

MTD is working to secure funding to partner with Ballard Power Systems to deploy an onsite Fuel Cell Training Center for employees and visitors. The Training Center would provide hands-on access to Ballard's latest generation fuel cell module, giving trainees access to simulated operation of sensors, actuators, compressors, pumps, valves, and diagnostic communications. New technicians would be provided the opportunity to safely explore the fuel cell module and diagnostic tools outside of the engine bay, away from high voltage and pressurized gas concerns. Experienced technicians will have the ability to work through troubleshooting challenges by reviewing component installations, wiring, and signal measurements with the same diagnostic tools as they use on the bus, but with the freedom to analyze and test without danger of damaging bus components or exposing hazards from electricity and hot surfaces. The Training Center would benefit the industry, serving as a model for transit agencies deploying FCEBs across the country.

Training Program

New hire, ongoing, and retraining is provided for bus operators and maintenance technicians by MTD's Safety and Training Department. When new technology is introduced, Bus Operators complete classroom and behind-the-wheel training with a certified trainer. Driving simulators are also used in the training curriculum. For the initial deployment of FCEBs in 2021, training was provided to operators and maintenance employees by in-house trainers as well as New Flyer and Ballard. Maintenance employees regularly receive hybrid drive training from BAE Systems as needed.

Apprenticeship Program

MTD has supported interns from Parkland Community College technical programs for over 20 years. 90 percent of MTD's current maintenance technicians are graduates of Parkland College. MTD and Parkland hope to further explore opportunities for apprenticeships, on-the-job training, and instructional training for electric vehicle technology. Expansion of this partnership would develop the first electric vehicle public education opportunity in our area. Parkland and MTD hope to expand the breadth of existing education to bring in electric vehicle technology curriculum including basic operation, function, service, and maintenance of the fuel-cell and electric vehicle systems.

Employee Consultation and Engagement

Maintenance technicians are involved in the new technology early on in the process, including participating in the specification, build, inspection, and road-testing process. The Maintenance Department utilizes a Training Committee, staffed with employees from all areas of the department. This committee is consulted on and engaged in training for new technology.

MTD utilizes employee committees as an opportunity for input on various issues affecting employees. Committees are groups of employees that serve as necessary to provide ideas, suggestions, and feedback on a particular issue or group of issues. By involving employees in this process, recommendations from the committee serve to maximize the interests of as many employees as possible. Employee committees include Wage & Policy / Problem Solving, Safety & Training / Accident Review, Routes & Schedules, Health & Fitness, Awards, Newsletter, Social & Community Affairs, School Task Force, Sustainability. Annual committee volunteer sign-up and elections, if necessary, take place in November and take effect on January 1st of each year.

The Wage & Policy / Problem Solving Committee is consulted on and participates in policies and initiatives. This committee consists of 13 members representing full-time operators, part-time operators, and maintenance employees who are elected by their peers and serve a two- or one-year term.