FY 2022 Low or No Emission Grant Program and the Grants for Buses and Bus Facilities Competitive Program

Applicant and Proposal Profile

Is this application for If applying to both programs, please check both boxes	s)	
	☐ Buses and Bus Facilities (FTA-2022-002-TPM-BUSC)	
	enter information for both programs on this form but Must submit the application packa ective Opportunity ID on Grants.Gov for each program. That is, complete 1 form, but sub	
Section I. Applicant Informa	ntion	
Organization Legal Name:	Montgomery County (MD) Department of Transportation	
FTA Recipient ID Number:	5352	
Organization Chief Executive Officer: (Name and Direct Phone Number)	Christopher Conklin, 240-777-7198	
Applicant Eligibility:	Direct or Designated Recipient	
	○ State	
	C Local Governmental Authority	
	A Federally-Recognized Indian Tribe	
Project Location:	Small Urbanized Area (50,000-199,999 people)	
	☐ Large Urbanized Area (200,000+ people)	
	Rural (less than 50,000 people)	
Description of services provided and areas serv		

the state of Maryland with over one million residents across 510 square miles. Montgomery County neighbors Washington, D.C., and is bordered by the Potomac River to the west. The County is in the Washington-Baltimore-Northern Virginia combined statistical area, which has over six million residents, and it is part of the National Capital Region Transportation Planning Board (TPB) Metropolitan Planning Organization (MPO).

MCDOT owns and operates almost 400 buses providing Montgomery County residents with reliable transit options and resources. Service coverage extends to 76% of the county's residents and 89% of employers and provides service within a quarter mile of 81% of the county's low-income households and 86% of households without cars. The MCDOT transportation systems coincide with other systems in the region, namely, the Maryland Department of Transportation (MDOT) and the Washington Metropolitan Transit Authority (WMATA). MCDOT works closely with these agencies to ensure transportation efficiency for all users.

The County's bus system is referred to as Ride On. Ride On operates 79 bus routes out of three bus depots, which are in Silver Spring, Gaithersburg and North Bethesda. Most Ride On routes serve at least one of the 13 Metrorail stations and eight MARC stations in the

county. Typical weekday service runs from about 5 a.m. until midnight with some routes starting as early as 4:25 a.m. and ending as late as 2 a.m. All routes operate during weekday rush hour and with varying service levels throughout the rest of the day. Weekend service is limited to 47 routes in operation on Saturdays and 37 routes in operation on Sundays. Modifications to bus service schedules are typically made three times per year in January, May, and September.

In FY 2020, Ride On weekday services averaged 2,689 daily revenue hours of service and carried 80,743 passengers. Due to the COVID-19 pandemic, annual ridership has subsequently decreased. In FY 2021 there was a decrease of 20.8 percent to an average weekday ridership of 53,287. Despite the pandemic, Ride On ridership has shown an upward trajectory since March 2020. Ridership has progressively increased and has allowed MCDOT to restore most of its pre-pandemic service routes. As of March 2022, bus service has been restored to 86 percent of pre-COVID levels. It is expected that ridership will continue to increase as the working population returns to an in-person working environment and COVID protocols continue to diminish.

MCDOT has recognized the importance of embracing sustainability in its operations, especially as an emphasis on slowing or reversing climate change has become more prevalent and legislative guidelines have become more pressing. Simultaneously with changes in the regulatory environment, market conditions for zero-emission bus (ZEB) products have also changed, with many more product types available and at lower costs than could be previously offered. Additionally, there is a public demand for a reduction in transportation pollution and cleaner ways to travel. Due to these converging conditions, now is the right time for MCDOT to move forward with a transition to a ZEB fleet to serve its ridership. MCDOT's commitment to transition to a ZEB fleet by 2035 is documented in its ZEB Transition Plan.

Section II. Project Information

About the Project

Project Title: Montgomery County Hydrogen Fuel Cell Buses and Fueling Site (Descriptive title of this project)

Project Executive Summary:

Montgomery County will implement the first green hydrogen transit application on the East Coast. The new hydrogen fuel production and fueling station, located at the County's existing David F. Bone Equipment Maintenance and Transit Operations Center (EMTOC) in Gaithersburg, will power the county's first 13 hydrogen fuel cell buses (FCBs). This project is an essential step in the County's transition to a zero-emissions fleet. Hydrogen buses will allow for coverage of longer bus routes.

Project Statement of Work (one sentence summarizing request):

Montgomery County will procure 13 zero-emission hydrogen fuel cell electric buses (FCBs) and construct a hydrogen fuel production/dispensing station in support of our bus transit service. MCDOT will partner with industry experts - the Center for Transportation and the Environment (CTE) and Trillium, to implement the project.

Propulsion Type:	☐ Battery electric					
	☐ CNG					
	Diesel					
	☐ Diesel-electric hybrid					
	Gasoline					
	$oxed{\boxtimes}$ Hydrogen fuel cel	l				
	Other					
	If Other, specify:					
Project Type:	□ Bus Replacement					
	Number of buses	to be replaced: 13				
	☐ Bus Rehabilitation	n				
	Number of buses	to be rehabilitated:				
	☐ Bus Expansion					
	Number of buses	for service expansion:				
	☐ Bus Facility Replace	cement				
	☐ Bus Facility Rehab	pilitation				
	Bus Facility Expan	sion				
	Bus Equipment					
	○ Other					
	If Other, specify:	Design and installation of a hydrogen production (electrolysis) and fueling facility, capable of producing enough fuel to support 20 FCBs.				
		Climate Change				
For Buses and Bus Facilities P	rojects, please describe th	ne significant community benefits relating to the environment. See NOFO Section E.2 for				
additional guidance: n/a. This is a Low No applic	cation					
il/a. Tills is a Low No appli	cation.					
	Enviro	nmental Justice Populations				
Is there an environmental	justice population(s) lo	cated within the service area? Yes No				
Describe the environment NOFO Section E.2):	al justice population(s)	and the anticipated benefits resulting from the project for those population(s) (see				
routes in the County's Equ	ity Emphasis Areas, whes. The project benefits	rease the reliability and sustainability of the bus fleet. Attachment A maps bus sich are census tracts with high concentrations of low-income individuals and/or the County's bus ridership in these areas, which is predominantly low-income and intage.				

Racia	Equity	/Barriers to	Op	portunity
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Does the project address racial equity or parriers to opportunity (see NOFO Section E.2)?	Yes	○ No
If yes, please describe:		
The project ensures the County's ability to provide sustainable and reliable bus service to its emission transit is informed by existing equity-based plans and policies, including the Count the Climate Action Plan and Thrive Montgomery 2050, an update to the County's leading plate to advance racial equity and reduce barriers through just planning policies and public invest	y's Racial Eq anning policy	uity and Social Justice Policy,

Creating Good-Paying Jobs

Applicants for facility projects, please describe how the project will support creating good paying jobs (see NOFO Section E.2):

This project will be maintained and operated in large part by the County's workforce, which is structured by Collective Bargaining Agreements with the Union. Bus builds, construction and additional ongoing operations and maintenance needs will create new job opportunities for contract workers. County contracts require a 21% minimum minority, female and disabled-owned business participation, a 10% minimum local businesses participation and adherence to the Prevailing Wage Law.

Zero-Emission Fleet Transition Plan - Workforce Involvement

For zero-emission projects, please explain how workforce representatives were included in the development of the workforce plan of the Zero-Emission Transition Plan and which of the three elements described in the NOFO Section E.2 were used to maintain job quality and avoid displacement of the existing workforce:

As outlined in the Zero Emission Bus (ZEB) Transition Plan (Attachment B), the County is developing a registered apprenticeship program to build a workforce capable of supporting ZEBs while targeting disadvantaged communities using on-the-job training, curriculum-based training and mentoring to attract, train, reskill and retain a successful workforce. The program and curriculum are being developed by the local labor union membership and management.

Justice 40

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u	oes me	projects	summer in inte	- 10500040	mmanver	

Describe how the project supports the Justice 40 Initiative and the benefits provided (see NOFO Section E.2):

The construction of the hydrogen production and fueling infrastructure will be on previously disturbed, industrial land within existing County property, thereby minimizing impacts on vulnerable communities. A key component of equity in transportation planning is avoiding the concentration of such land uses in low-income and disadvantaged communities. The expanded use of EMTOC reinforces the County's desire to use this project to advance an equitable approach to the energy and transportation transition to zero carbon. EMTOC is not located in a Historically Disadvantaged Community.

Zero-emission vehicles will benefit the County's bus riders. The median annual income of Ride On passengers is \$35,000, according to a 2018 passenger survey, and 47% of riders report an annual household income of less than \$30,000. Additionally, 78% of riders are

Black, Indigenous, or People of Color (BIPOC). Additionally, English is not the native language of 42% of riders.

Describe the methodology used to determine the project meets the Justice40 Initiative (see NOFO Section E.2):

To determine whether the project meets the Justice40 initiative, we used GIS data defined by the National Capital Area Transportation Planning Board (TPB) as Equity Emphasis Areas, which are census tracts with high concentrations of low-income individuals and/or racial and ethnic minorities. Equity Emphasis Area Documentation (Attachment A) shows the overlap of our routes with these areas and describes the methodology.

We also utilized the Alternative Fuel Life-Cycle Environmental and Economic Transportation Tool 2020, developed by Argonne National Laboratory, in estimating the local harmful particulates emitted annually by fueling and operating a modern fossil fuel bus versus a hydrogen fuel cell bus, as well as the estimation of the well-to-wheel greenhouse gases emitted annually by fueling and operating both a hydrogen fuel cell bus versus a modern fossil fuel bus.

Justice 40 Population Impacted

Justice 40 Disadvantaged Community Served as Identified in the NOFO Section E.2	Actual or Estimated Annual Ridership Count
Black or African American	5,629,680
Hispanic or Latino	2,877,392
Primary Language other than English	6,677,426
Annual Household Income Less Than \$30K	7,302,946
What is the percentage of Disadvantaged Communities within the project area? 21 %	6
Was this estimate generated using the Justice40 online mapping tool? • Yes	○ No

		Project	Budget				
Description	F QTY	ederal Amount Requested	Local Match Amount	Other Federal Funds	Other	Total Cost	
Hydrogen Fuel Cell Bus (13)	1	4,343,300	12,361,700	0	0	16,705,000	X
	F	ederal Amount	Local Match	Other Federal			
Description	QTY	Requested	Amount	Funds	Other	Total Cost	
Hydrogen Fuel Site Prep/Construction	1	1,489,220	165,469	0	0	1,654,689	X
	F	ederal Amount	Local Match	Other Federal			
Description	QTY	Requested	Amount	Funds	Other	Total Cost	
HFC Equipment and Freight (Electrolyzer/ Compression/Storage/ Dispensing)	1	6,852,565	761,396	0	0	7,613,961	X

Description	QTY	Federal Amount Requested	Local Match Amount	Other Federal Funds	Other	Total Cost	
CTE - Project Consultant	1	385,600	96,400	0	0	482,000	X
Description	QTY	Federal Amount Requested	Local Match Amount	Other Federal Funds	Other	Total Cost	
Trillium - Design/Engineering, Project Management	1	645,290	71,699	0	0	716,989	X
Description	QTY	Federal Amount Requested	Local Match Amount	Other Federal Funds	Other	Total Cost	
Workforce Development	1	1,160,000	290,000	0	0	1,450,000	X
Т	otal:	14,875,975	13,746,664	0	0	28,622,639	
Does the project budget include funding for workforce development activities or training at the National Transit Institute (NTI)? Yes No							
For zero emission projects, is 5% of the project budget for workforce development training as outlined in the applicant's Zero-Emission Transition Plan?							
If no, please explain why the full 5% is not needed:							
n/a							

Matching Funds Information

Match	ıng F	unds	Amoun	it:
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13,746,664

Source of Matching Funds:

Montgomery County is committed to a match amount of \$13,746,664, which is 43 percent of the total project cost. The matching funds will be a \$13,746,664 cash match from the Ride On Bus Fleet Capital Improvement Project (CIP) in Montgomery County's Capital Budget FY 2023-2028. This CIP (project number 500821) supports the purchase of replacement and expansion buses and is funded for \$155.4M over the next six years (FY23-FY28) as detailed in Budget Documents (Attachment C). Based on the project timeline, we expect the matching funds to come from the FY23 and FY24 allocations.

Supporting Documentation of Local Match:

Budget Documents (Attachment C) details the FY23-FY28 CIP for the Ride On Bus Fleet Project, CIP Number 500821, and is taken from the FY23-FY28 Montgomery County Capital Budget Book.

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Project	Sca	labi	lity
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Is project scope scalable? • Yes No

If Yes, specify minimum Federal Funds necessary:

10,677,675

Provide explanation of scalability with specific references to the budget line items above:

The minimum amount of federal funds necessary for this project is \$10,677,675. With a reduced project budget of \$24,424,339, the County could still implement the hydrogen fueling production, storage and dispensing site and use it to power nine (9) FCBs.

In this scenario, the County would reduce the number of FCBs from 13 to nine (9). The rest of the project budget would remain unchanged.

A scaled-back version of the project would reduce the near-term environmental benefits of zero-emission vehicles and delay the realization of the investment's full benefits. The County would also need to delay the retirement of at least four gas-powered vehicles due to the reduction in replacement buses.

Project Timeline (Please be as specific as possible)

Timeline Item Description	Timeline Item Date
FTA Award and Project Consultant Contract Execution	12/30/2022
Project Planning and Initiation	01/03/2023
Initiate Infrastructure Procurement, Design and Build	02/01/2023
Complete Requirements Analysis	03/31/2023
Initiate Bus Procurement and Build	04/03/2023
Complete Infrastructure and Training	06/30/2025
Complete Bus Delivery, Acceptance & Training	07/18/2025
Revenue Service Deployment	07/31/2025
Complete Deployment Validation	09/30/2026
Project Closeout	12/31/2026
Project Management and Reporting Complete	12/31/2026

	Congressional Districts (Project Location)	
Congressional District		
MD-003		
MD-006		
MD-008		

Partnership Provision

Note: the partnership provision is only applicable to low or no emission projects that are applying to the Low-No Program or both the Low-No and Bus Program. Projects applying only to the Bus program are not eligible to use the partnership provision. See NOFO Section C(1).

Is this application a partnership between an eligible applicant and one or more partners?

Yes
No

If yes, please list the partner(s) and describe their qualifications:

Montgomery County is partnering with the Center for Transportation and the Environment (CTE). CTE is a member-supported 501(c) (3) nonprofit organization that develops, promotes, and implements advanced transportation technologies, vehicles, and fuels that reduce environmental pollution and fossil fuel dependency. CTE is the national leader in providing technical assistance for zero-emission bus (ZEB) deployments. CTE provides the expertise necessary to help transit agencies mitigate risks associated with ZEB deployments. CTE understands the technical and administrative challenges associated with the procurement, deployment, and operation of ZEBs and has managed a range of ZEB projects over the last decade, from new bus development and demonstration projects to full fleet deployment projects. CTE has provided technical and management support to more than 75 transit agencies that have either deployed or will soon deploy more than 400 ZEBs and is currently supporting multiple transit agencies with the design and implementation of hydrogen fueling and FCBs, including Orange County Transportation Authority, Champaign Urbana Mass Transit District and Foothill Transit.

Montgomery County has also opted to partner with Trillium for the design and construction of the fueling station due to their experience with hydrogen fuel stations that make hydrogen onsite by use of an electrolyzer, along with their strong history of supporting transit fleet transitions to alternative fuels. Additionally, Trillium is the current operator of the County's CNG site at the proposed location, thereby reducing the operating cost of the new system.

Trillium has already deployed hydrogen fueling for transit fleets at two locations for Orange County Transportation Authority and Champaign Urbana Mass Transit District and kicked off their 3rd Hydrogen Fueling station for North County Transit District in Oceanside, CA. Trillium also has CNG and renewable natural gas (RNG) fueling at over 200 locations nationwide serving transit, waste and over-the-road fleets. Their extensive knowledge and experience include efficient station design and engineering, utility coordination, Authorities Having Jurisdiction (AHJ) coordination and low-carbon fuel production/procurement.

Trillium has an in-house engineering, design and construction team that work exclusively on the development of high-performing alternative fueling stations. The team has a combined experience of over 100 years, with the lead engineer having over 20 years of experience in the development of clean fueling infrastructure. Over the last two decades, the has team fine-tuned its approach to designing energy and time efficient stations.

Trillium has a proven track record of timely completion of station design and build projects, with an added advantage of nearly three decades of experience installing and operating alternative fueling stations, like the system proposed for Montgomery County.

CTE and Trillium Statements of Qualifications are provided in Statements of Qualifications & Commitments (Attachment D).

Section III. Evaluation Criteria

*** Address each of the evaluation criteria as described in the Notice of Funding Opportunity.***

Demonstration of Need

Montgomery County's Climate Action Plan, which will increase resilience in the face of climate hazards, is one of the most ambitious climate plans in the nation for a local government. The plan calls for the reduction of emissions in the transportation sector and commits the County, which operates nearly 400 public transit buses, to transition to a zero-carbon emissions fleet by 2035. Montgomery County purchased its first zero-emission battery-electric buses (BEBs) in 2020 with assistance from the FTA. A crucial next step for Montgomery County in achieving zero emissions transit goals is to act locally while serving as a national leader, through the implementation of the Hydrogen Fuel Cell Fueling Site and Bus Project.

Achieving the County's ambitious goals requires both a strong commitment to quickly implement innovative, sustainable technology and continued investment in high-quality transit to encourage people to shift to sustainable transportation modes. This project's construction of a hydrogen fuel production system and fueling station and procurement of 13 hydrogen fuel cell buses (FCBs) will be the largest public transit application of green hydrogen fuel produced on-site on the East Coast. The FCBs will replace nine (9) 2013 diesel-fueled buses and four (4) 2014 CNG-fueled transit buses. The purchase of these buses is fully consistent with the county's Fleet Management Plan (Attachment E). The fleet management plan is to replace our transit buses as they reach their useful life. This project also conforms to the FTA's spare-ratio guidance.

Montgomery County owns four BEBs and is awaiting the delivery of 10 additional BEBs in the summer of 2022. BEBs are an important addition to our fleet, but they cannot meet all our needs. Based on analysis completed by CTE, the County can only expect to reliably operate approximately 28% of our routes on a single overnight charge today using BEBs, under all operating conditions (seasonal temperature variations and passenger loading). While the percentage is expected to climb to almost 60% by 2035 as technology improves, it still leaves a significant gap.

The addition of FCBs, alongside BEBs, will support the County's transition into a diversified, clean and sustainable transit fleet. FCBs will be particularly useful at the County's Gaithersburg depot where, as of 2020, 80% of buses had a standard daily range of over 150 miles. According to a study at the Altoona Bus Testing Facility, BEBs had a maximum range of 21.5 miles to 145 miles and FCBs had a 200-mile daily range in an arterial bus profile similar to Ride On routes. FCBs require refueling practices similar to CNG and offer a range comparable to conventional buses; FCBs could be expected to reliably cover all of the County's routes.

The new green hydrogen fuel production and fueling station will be located at the County's existing Gaithersburg depot, known as the David F. Bone Equipment Maintenance and Transit Operations Center (EMTOC). Hydrogen fuel production at this site will be greener than traditional fossil fuel-based hydrogen production, as the hydrogen fuel will be produced from water using zero-emission electrolysis.

Montgomery County, as the lead agency of the Montgomery County Clean Energy Buyers Group, is fourth in the nation of local governments for the 467.339 million kilowatt-hours of electricity it purchases from green energy sources through Unbundled Renewable Energy Certificates. These certificates represent 151 percent of its annual electricity consumption to offset both electricity and on-site fossil fuel consumption, accompanied by at least 20 percent of actual electricity consumed.

Demonstration of Benefits

Note: If applying to both programs, be	e sure to select "yes" ar	nd provide a response to	o both questions below.
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Is this an application to the Low-No Program?

Yes

O No

Please describe the benefits of the proposed project per the statutory requirements of the Low-No Program (see NOFO Section E(1)(b)(i)):

The proposed project will allow Montgomery County to remove nine 2013 model year diesel-fueled buses, and four 2014 model year CNG-fueled buses from service and deploy thirteen zero-emission FCBs in their place. Combined, the 13 buses being replaced operate for approximately 531,952 miles and consume 89,577 gallons of diesel fuel and 49,904 gallons of CNG fuel each year.

Deploying FCBs in place of fossil fuel vehicles will reduce energy consumption and harmful emissions, including greenhouse gases and particulates. The FCBs that MCDOT is proposing to put into service consume less energy per mile than buses that use other

common propulsion technologies, such as gasoline, diesel, and natural gas engines. Even when considering well-to-wheel energy requirements, FCBs are a more efficient transit solution than these other vehicle technologies. Operating FCBs instead of comparable modern fossil fuel buses (model year 2022 diesel and CNG bus) will reduce the amount of energy that MCDOT uses each year by 6,300 gigajoules (GJ). That energy is equivalent to 105 years' worth of gas for the average American car driver, every year.
Deploying the zero-emission buses in place of the existing vehicles will reduce Montgomery County's annual greenhouse gas emissions by approximately 640 tons and prevent the release of 7.1 pounds (lbs.) particulate matter under 2.5 micrometers (PM2.5), which has a considerable health impact on the local community. This reduction in emissions of GHGs and particulates results in a social cost savings of \$82,400 annually, in accordance with Executive Order 13990.
Compared to modern fossil fuel buses (model year 2022), deploying the zero-emission buses will also reduce annual greenhouse gas emissions by approximately 640 tons. In addition, compared to modern fossil fuel buses, zero-emission buses will reduce production of particulate matter under 2.5 micrometers (PM2.5) by 3.5 lbs. annually. This reduction in emissions of GHGs and particulates results in a social cost savings of \$81,700 annually, in accordance with Executive Order 13990. Details on the emissions estimates are included in the Benefits Calculation Methodology (Attachment F).
Is this an application to the Buses and Bus Facilities Program? Yes No
Is this an application to the Buses and Bus Facilities Program? Yes No Please describe the benefits of the proposed project per the statutory requirements of the Buses and Bus Facilities Program (see NOFO Section E(1)
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Planning and Local/Regional Prioritization

Montgomery County has been a national leader in responding to the challenge of climate change and implementing clean transit regulations. In December 2017, Montgomery County adopted the Montgomery County Council Emergency Climate Mobilization Resolution 18-974. This resolution set the objective to reduce greenhouse gas (GHG) emissions by 80 percent by 2027 and 100 percent by 2035. Resolution 18-974 aligns with MCDOT's goal to transition to a ZEB fleet by 2035.

In June 2021, Montgomery County finalized its Climate Change Action Plan. This is an aggressive plan that implements measurable, time-bound strategies and actions to reduce greenhouse gas emissions and adjust to the changing environment. MCDOT is supporting the efforts of the Climate Change Action Plan by pledging to a zero-emission bus fleet by the year 2035. MCDOT is committed to meeting this goal and create a link between efficient transportation systems and low environmental impacts. The County is also committed to creating sustainable transit facilities with all systems electrifications.

Montgomery County's Zero Emissions Bus Transition Plan (Attachment B) outlines the potential fleet procurement process and composition needed to complete a 100 percent ZEB fleet by 2035 to meet the County's Climate Action Plan goals and achieve key milestones MCDOT is forecasting regarding needed facility and infrastructure upgrades. This project is consistent with the transition plan, which references the incorporation of a new green hydrogen fuel production and fueling station into its infrastructure to serve the hydrogen fuel cell bus fleet.

This project is consistent with State goals to reduce the use of fossil fuels. In July 2020, Governor Hogan signed Maryland into the Multi-State Zero Emission Medium- and Heavy-Duty Vehicle Memorandum of Understanding. This is a 15-state commitment to work together to phase out fossil fuel usage for electric medium- and heavy-duty vehicles, including large pickup trucks and vans, delivery trucks, box trucks, school and transit buses, and long-haul delivery trucks (big-rigs).

Governor Hogan signed Maryland into the United States Climate Alliance. This multi-state partnership of governors' pledges to reduce carbon emissions in line with the Paris Agreement. Specifically, each member state commits to "reducing collective net GHG emissions at least 26-28 percent by 2025 and 50 -52 percent by 2030, both below 2005 levels, and collectively achieving overall net-zero GHG emissions as soon as practicable, and no later than 2050."

This project directly responds to the regional transportation goals adopted by the National Capital Transportation Planning Board (TPB) and identified in the Washington region's long-range transportation plan, Visualize 2045. The TPB has long supported increased investment of transportation dollars to support improvements in the environment and the region's bus system. New buses using zero emissions systems will provide benefits to the region's citizens and visitors through cleaner and higher quality public transportation service. The support and promotion of electric vehicles and of public transportation are key strategies of our adopted Regional Transportation Priorities Plan.

The relevant pages from regional and local policy documents are included in Attachment G.

This project is supported by local government officials, public agencies, and non-profit or private sector supporters. The Letters of Support (Attachment H) include testimonies from the following:

- U.S. Congressional Delegation from Montgomery County
- Montgomery County Executive
- Montgomery County Council
- Montgomery County Planning Board
- Maryland Energy Administration
- National Capital Region Transportation Planning Board
- MCGEO Local 1994
- Washington Suburban Sanitary Commission (WSSC)
- Pepco
- Baltimore Electric and Gas (BG&E)
- Coalition for Smarter Growth
- Sierra Club

Local Financial Commitment

Montgomery County is committed to a match amount of \$13,746,664, which is 48 percent of the total project cost. The matching funds will be a \$13,746,664 cash match from the Ride On Bus Fleet Capital Improvement Project (CIP) in Montgomery County's Capital Budget FY 2023-2028. This CIP (project number 500821) supports the purchase of replacement and expansion buses and is funded for \$155.4M over the next six years as detailed in the Budget Documents (Attachment C). Based on the project timeline, we expect the matching funds to come from the FY23 and FY24 allocations.

The incremental difference of purchasing 13 FCBs instead of 13 standard diesel propulsion vehicles is estimated at approximately \$9.88M, which represents two-thirds of the full federal request of approximately \$14.88M. The County proactively developed its capital budget assuming costs for battery electric buses and chargers, which means that, it can stretch the funds further to cover both the hydrogen fuel cell vehicles and the necessary fueling infrastructure with the FTAs assistance.

The federal funding request of approximately \$14.88M is the incremental cost of implementing hydrogen fuel cell technology over the cost of battery electric.

Project Implementation Strategy

Can this project be obligated within 12 months?

Yes
No

As the project lead, Montgomery County will be responsible for compliance with all FTA requirements. Montgomery County has staff with federal and state grant funding expertise and will obligate the funds and add the project to the STIP and TIP within 12 months of selection.

The project will implement in nine phases: FTA Award & Contract Execution; Project Planning & Initiation; Requirements Analysis; Bus Procurement & Build; Infrastructure Procurement; Design & Build; Bus & Infrastructure Deployment; Deployment Validation; Project Close-out; and Project Management, Administration, Reporting & Control. The Project Management Plan and Timeline (Attachment I) contains a description of each phase and the details of the schedule.

The Center for Environment and Transportation (CTE) will provide project management support and technical assistance to the County throughout the project. CTE has extensive experience in executing FTA Low-No projects with similar scope. Deployment of the buses in passenger service is expected to occur approximately 30 months after the project award. The deployment will be followed by 12+ months of Deployment Validation. The entire program will be guided by project and risk management controls & procedures and incorporate elements of FTA's Quality Management System.

It is anticipated that the lead federal agency for environmental review as part of the National Environmental Policy Act (NEPA) would be the Federal Transit Administration (FTA). The class of action for the project is anticipated to be either a "c-list" or "d-list" Categorical Exclusion in accordance with 23 CFR 771.118(c)(7) or (8) or 23 CFR 771.118(d)(6). While the environmental review has not been initiated, this anticipated class of action could be completed within the grant funding time frame.

The County, with support from CTE, will prepare an RFP for fuel cell bus selection. Following contract execution, Montgomery County will monitor the progress of the bus purchases and complete the necessary inspections and Buy America Audits.

Trillium will prepare the station design and will obtain the necessary permits for construction. CTE will assist the transit agency in establishing and coordinating a third-party, independent safety review of preliminary fueling station design plans prepared by the vendor. CTE will also work with Trillium and the bus OEM to provide a seamless fueling interface that will meet Montgomery County's requirements for refueling its fleet. Trillium will also work with Montgomery County and local utilities to provide the necessary utilities to operate the station.

Montgomery County will select an Architecture and Engineering firm, either through RFP or existing on-call services contract that was competitively bid, to complete the design and upgrade of the existing maintenance facility to support fuel cell electric bus maintenance, including the installation of the necessary hydrogen detection equipment.

Once the site preparation for the station is completed, Trillium will install and commission the equipment, during which Montgomery County will coordinate weekly communication meetings and provide project overview and recommendations. CTE will organize and coordinate with Montgomery County, the OEM, Trillium, first responder and employee safety and operations training.

Following construction completion, Montgomery County, Trillium, CTE and the fuel cell bus OEM will participate in station commissioning to ensure that the production and fueling station are operating properly.

The County will be responsible for operating and maintaining the project equipment according to FTA's standards legal, financial, maintenance and continuing control; will maintain cash flow, receive, and pay invoices after deliverable approval; will be responsible for the ownership, operation, and ultimate disposal of all equipment according to FTA guidance; and will submit quarterly and final grant reports to the FTA and for g

Technical, Legal, and Financial Capacity

Montgomery County is experienced in implementing innovative technologies as part of its transit infrastructure and fleet. The County's track record of sustainable, innovative and fiscally responsible management makes it uniquely suited to spearhead the region's adoption of green hydrogen fuel for transit.

Recently in support of the County's Climate Action Plan and because of federal grants, Montgomery County has acquired several electric vehicles and implemented electric charging infrastructure at both EMTOC and the Silver Spring Depot. In September 2021, the County broke ground on a microgrid solar energy project at the Silver Spring Depot that will power MCDOT's growing electric bus fleet. EMTOC, where the hydrogen fuel site will be located, is one of the most innovative transit administration and fleet maintenance facilities in the country. The nationally recognized LEED Gold certified building features water reclamation systems, solar lighting, active and passive noise reduction and a large, vegetated roof. This successful and timely large-scale project implementation demonstrates Montgomery County's capacity for implementing the latest in green building and transportation technology. Montgomery County hopes to serve as an example of best practices once again for the rest of the country.

Maryland and Montgomery County do not currently have specific regulations or standards for the permitting of hydrogen fueling infrastructure. The hydrogen fueling station will require electrical and building permits from Montgomery County. The county plans to partner with the Maryland Energy Administration (MEA) to use this project as a pilot for implementing statewide standards or quidance for permitting and approvals and will influence future policies and standards.

The County's fiscal policies are committed to protecting its AAA bond rating. Additionally, Montgomery County was recognized for its Comprehensive Annual Financial Report (CAFR) for the year ending June 30, 2020. The County has received this award 49 times since 1951, and consecutively for 48 years since 1972, more than any other County in the nation. This award represents the highest form of recognition in governmental accounting and financial reporting and its attainment represents a significant accomplishment by a government and its management. The County did not have any 'single audit findings' in FY2018, FY2019 or FY2020.

The County has a strong record of compliance with FTA regulations with regards to funding for both formula and discretionary grants, as evidenced by our past Triennial reviews. In house staff have combined decades of experience in meeting and successfully dealing with such requirements and guidance.

Attachment A

Equity Emphasis Area Documentation

Hydrogen Fuel Cell Buses and Fueling Site Montgomery County, Maryland

Low or No Emissions Grant Program 2022



Methodology for Equity Emphasis Areas

As Adopted by the TPB in March 2017

The methodology for the Equity Emphasis Areas was adopted by the National Capital Region Transportation Planning Board (TPB) in March 2017. Tract-level Census data is used to identify communities that have significant concentrations of low-income and / or minority populations. Data from the American Community Survey for each of the following four population groups is used:

- Low-Income¹
- African American,
- Asian, and
- Hispanic or Latino.

To identify concentration, the tract percent for each group was divided against its respective regional average.² This resulted in a tract-level Ratio of Concentration, or the number of times the regional average, for each population group.

To identify tracts with significant concentrations of low-income or minority population groups, as well as to normalize and compare results across the four groups and region, an Index Score is calculated based on each groups' Ratio of Concentration for every tract in the region. Index Scores for each population group is aggregated to reach an uncapped Total Index Score. Total Index Scores greater than or equal to 4.00 are considered Equity Emphasis Areas.

Tract are identified as Equity Emphasis Areas if one of two criterions are met: Tracts must have a concentration of individuals identified as low-income more than one-and-a-half times the regional average (see Table 1 below) or high concentrations of two or more minority population groups and/or high concentrations of one or more minority population groups together with low income concentrations at or above the regional average (see Table 2 on next page). Index scores are used to ensure that these conditions are met.

Table 1: Scoring for Criteria 1 - Low-Income Population Concentration

RATIO OF CONCENTRATION	INDEX SCORE	
(ROC or times the regional average)	Low-Income*	
Between 1.5 and 3.0	4.5 to 9.0	
Greater than 3.0	9.0	
Index Score	4.5 to 9.0	

¹ A person is considered low-income if their household income is less than one-and-a-half times the federal government's official poverty threshold which varies by household size.

^{*}The ROC for low-income is multiplied by three to determine the index score but capped at 9.0.

² Region is defined as the TPB Planning Area: http://www.mwcog.org/transportation/tpb/jurisdictions.asp.

Table 2: Scoring for Criteria 2 - Minority Population Concentration and Secondary Low-Income Thresholds

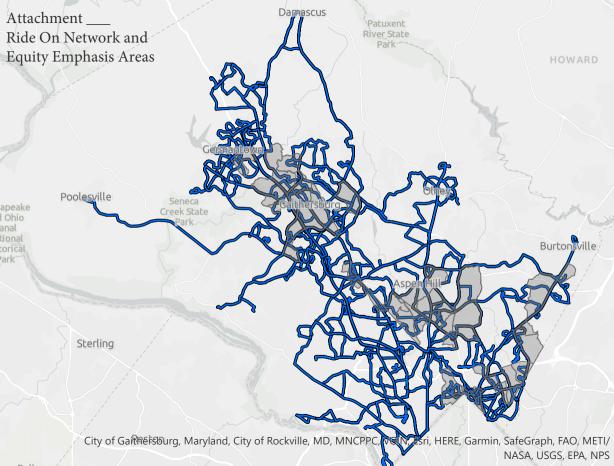
RATIO OF	INDEX SCORE			
CONCENTRATION (ROC or times the regional average)	Low- Income*	African American	Asian	Hispanic or Latino
Less than 1.0	0	0	0	0
Between 1.0 and 1.49	1.0 to 1.49	U	O	U
Between 1.5 and 3.0	See Criteria 1 (4.5 to 9.0)	1.5 to 3.0	1.5 to 3.0	1.5 to 3.0
Greater than 3.0	See Criteria 1 (9.0)	3.0	3.0	3.0
Total Index Score	Index scores are totaled			
$lacktriangle$ Equity Emphasis Area (EEA) (Total Index \geq 4.00) $lacktriangle$ Not an Equity Emphasis Areas (EEA) (Total Index $<$ 4.00)				

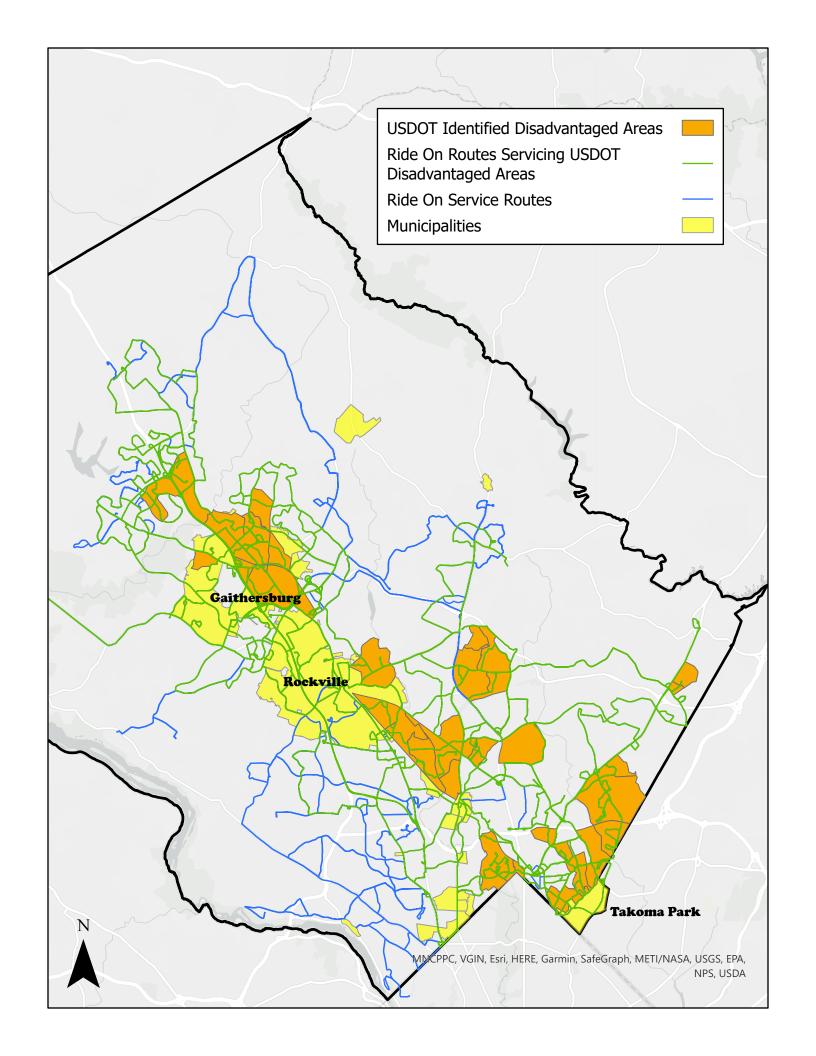
PURPOSE AND UPDATE PROCESS

The TPB is required to analyze the long-range transportation plan for disproportionately high and adverse impacts on low-income and minority populations. The TPB's primary purpose for the Equity Emphasis Areas map is as an analytical tool to identify regional impacts of the planned transportation projects as whole by comparing accessibility and mobility measures for the Equity Emphasis Areas compared to the rest of the region.

Additionally, the Equity Emphasis Areas will be used in other planning activities and will be made available to local jurisdictions to assist with considering equity in initiatives such as education, health, and green space.

The Equity Emphasis Areas map will be revised with the latest Census data in conjunction with each major long-range transportation plan update.





Ride On Bus Routes and Services

OLO Report 2020-10

EXECUTIVE SUMMARY

October 6, 2020

This Office of Legislative Oversight (OLO) report responds to Council's request to better understand (1) who uses Montgomery County Department of Transportation (MCDOT) Ride On bus services, (2) how MCDOT makes changes to Ride On services, and (3) how similar jurisdictions evaluate their transit networks. This report also provides information about Ride On data collection and reporting. OLO analyzed MCDOT Ride On reports, conducted interviews with County Government staff and community stakeholders, and researched transit decision processes in ten jurisdictions. In sum, OLO found that MCDOT routinely collects and reports transit data and engages in a regular process to review bus routes and services; however, opportunities exist to define Ride On goals, strengthen performance metrics, and increase transparency of MCDOT's transit decision processes.

Demographics of Ride On Riders. Under Title VI of the Civil Rights Act of 1964, the federal government requires the County to survey Ride On customers at least every five years. MCDOT's 2018 Title VI on-board surveys reported the following demographics of Ride On customers:

- Residence: About 89% of Ride On customers were County residents.
- Race/Ethnicity: 78% of customers were categorized as Black, Indigenous, or People of Color (BIPOC); 36% of customers were African American.
- Language: 42% of customers spoke a language other than English at home. Of those speaking a language other than English, the primary language spoken was Spanish (50.9%) followed by French (16.6%).
- **Income**: 47% of customers reported an annual household income of less than \$30,000.
- **Education**: 69% of customers had a Bachelor's degree, a post-graduate degree, or some college education.
- Age: 29% of Ride On customers were between 35 and 54 years old.

Ride On Routes and Services

MCDOT's Transit Services Division manages and operates the Ride On bus system, which as of 2018 was being used by 38,070 people on an average weekday. The Division also evaluates and develops the routes, plans, and schedules service, and reviews all the routes and services at least once every two years.

MCDOT provides Ride On bus services across 495 miles in the County. In 2018, the Ride On program consisted of 79 fixed routes that provided about 22 million unlinked passenger trips. Ride On operates mainly in neighborhoods as a collector and distributor to major transfer points and transit centers in the County. In 2018, 61% of customers reported using Ride On services daily (5-7 times per week).

Ride On Goals and Objectives. The County last updated Ride On's goals in the 2008 Strategic Transit Plan, restating them in the *Bus Fleet Management Plan for 2013 to 2020*, published in 2014. The 2008 recession delayed many of the stated goals provided below. OLO found Ride On's goals and objectives have not been updated to reflect recent County priorities and Ride On's place within the County's changing transit network.

- Double transit ridership by 2020
- Provide transit service to all areas that have an average of 3+ households or 4+ jobs per acre
- Increase peak hour frequency to every 10 minutes or better
- Increase span of service for local buses to 19-24 hours of service per day
- Target pockets of low-income areas with nontraditional services

- 25+ Park & Ride lots in the County
- 100% customer service satisfaction
- 5,500 bus stops American with Disabilities Act (ADA) compliant
- Capacity for 600 buses
- Fleet reliability: 100%
- 95% on-time performance
- Keep pace with latest technology
- Operate 100% environmentally friendly buses

For a complete copy of OLO-Report 2020-10, go to:

http://www.montgomerycountymd.gov/OLO/Reports/CurrentOLOReports.html

Ridership Demographics 2 of 4 OLO Report 2020-10: Ride On Bus Routes and Services

Chapter 5. Demographic Profile of Ride On Customers

This chapter summarizes the most recent demographic data available about Ride On customers. Under Title VI the Civil Rights Act of 1964, the federal government requires the County to survey Ride On customers at least every five years to determine riders' race, color, national origin, English-proficiency, language spoken at home, household income, type of fare purchased, and travel patterns.⁶³ The demographic information in this chapter is derived from on-board surveys conducted in 2018 and reported by MCDOT in *Ride On Title VI Data Report*, May 2019 (371 pages).

More details for the items noted below with an asterisk (*) can be found in tables on the following pages.

Customers	Roughly 38,070 people used Ride On services on an average weekday.
Daily use*	Over 60% of customers said they used Ride On daily. (See Table 5-1.)
Residence	About 89% of Ride On customers were County residents.
Trips	58% of trip origins were home and 43% of trip destinations were work
Gender	Customers were about equally male and female.
Race/Ethnicity*	36% of Ride On customers were Black or African American. (See Tables 5-2 and 5-7.)
	78% of customers were categorized as Black, Indigenous, or people of color (BIPOC). ⁶⁴
Language*	42% of customers spoke a language other than English at home. (See Table 5-3.)
Income*	47% of riders reported an annual household income of less than \$30,000 dollars. (See Table 5-4.)
Education*	69% of the customers had a Bachelor's degree, a post-graduate degree, or some college education. (See Table 5-5.)
Age*	29% of Ride On customers were between 35 and 54 years old. (See Table 5-6.)
Smartphones	79% of customers had a smartphone.
Credit Cards	69% of customers owned a credit or debit card.
Employment	18% of survey respondents were Federal employees or contractors.
Access Mode	Over 58% of customers said their mode of access (getting to the bus) and egress (travel mode used after getting off the Ride On bus) was walking. Other modes in declining order: Metrorail, another Ride On bus, a Metrobus, or a car that was parked).

The next three pages include tables with more details from the Title VI survey responses.

Bank of St. Louis (FRED) Economic Research.

⁶³ Ride On Title VI Data Report (May 2019), p.1.

⁶⁴ The Title VI surveys asked Ride On customers to select a response identifying themselves as White, American Indian or Alaskan Native, Black or African American Descent, Asian, Hawaiian or other Pacific Islander, Hispanic, Middle Eastern Descent, Two or More Races, or Rather not say. The Title VI reports appear to use the term "minority" to refer to the customers who selected a response other than White or Rather not say. This OLO report will use the term Black, Indigenous, or people of color (BIPOC) in place of "minority" when referring to that Title VI survey data.

⁶⁵ The median annual household income for a family of four in Montgomery County in 2018 was \$108,000. Federal Reserve

Ridership Demographics 3 of 4 OLO Report 2020-10: Ride On Bus Routes and Services

Table 5-1. Frequency of Use

Weekly trips	# of Survey Responses	%
Daily (5-7 trips)	5,733	60.7%
Often (4-8 trips)	2,387	25.3%
Occasionally (1-3 trips)	1,321	14.0%
Total Responses	9,441	100%
No Response	1,456	
Total Surveys	10,897	

Source: Title VI Data Report (May 2019), Table 18, p.26.

Table 5-2. Race and Ethnicity

Race/Ethnicity	# of Survey Responses	% of Total
Black or African American	3,828	36.0%
White	2,078	19.6%
Hispanic or Latinx	1,956	18.4%
Asian	973	9.2%
Two or More Races	622	5.9%
Rather Not Say	958	9.0%
Other categories	205	1.9%
Total Responses	10,620	100%
No Response	277	
Total Surveys	10,897	

Source: Title VI Data Report (May 2019), Table 7, p.12.

Table 5-3. Predominant Language Spoken at Home

Primary Language Other Than English	# of Survey Responses	% of Total
Yes	4,547	42.7%
No	6,084	57.2%
Other	10	0.1%
Total Responses	10,641	100%
No Response	256	
Total Surveys	10,897	
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Source: Title VI Data Report (May 2019), Table 8, p.13.

Table 5-3(a) Of those speaking a language other than English at home, the primary language spoken was:

Spanish	1,415	50.9%
French	460	16.6%
Amharic	214	7.7%
Chinese	117	4.2%
Hindi	79	2.8%
Tagalog	78	2.8%
Portuguese	38	1.4%
All Other Languages	378	13.6%
Total	2,779	100%

Source: Title VI Data Report (May 2019), Table 9, p.14.

Ridership Demographics 4 of 4 OLO Report 2020-10: Ride On Bus Routes and Services

Table 5-4. Annual Household Income

Annual Household Income	# of Survey Responses	%
Less than \$20,000	2,483	27.3%
\$20,00 to \$29,999	1,760	19.4%
\$30,000 to \$49,999	1,755	19.3%
\$50,000 to \$74,999	1,052	11.6%
\$75,000 to \$99,999	687	7.6%
\$100,000 to \$149,999	701	7.7%
\$150,000 to \$199,999	400	4.4%
\$200,000 or more	249	2.7%
Total Responses	9,087	100.0%
No Response	1,810	
Total Surveys	10,897	

Source: Title VI Data Report (May 2019), Table 13, p.19.

Table 5-5. Education

Education Level	# of Survey Responses	% of Total
High School	2,533	24.4%
GED	695	6.7%
Some College	3,155	30.4%
Bachelor's Degree	2,132	20.6%
Post-Graduate	1,850	17.8%
Total Responses	10,365	100%
No Response	532	
Total Surveys	10,897	

Source: Title VI Data Report (May 2019), Table 12, p.18.

Table 5-6. Age

Age	# of Survey Responses	% of Total
Under 18	535	5.1%
18 - 24	2,406	22.7%
25 - 34	2,457	23.2%
35 - 54	3,102	29.3%
55 - 64	1,379	13.0%
65+	704	6.7%
Total Responses	10,583	100%
No Response	314	
Total Surveys	10,897	

Source: Title VI Data Report (May 2019), Table 11, p.17.

Attachment B

Zero Emission Bus (ZEB) Transition Plan

Hydrogen Fuel Cell Buses and Fueling Site Montgomery County, Maryland

Low or No Emissions Grant Program 2022



Zero Emission Bus Transition Plan



May 2022



MCDOT - Zero Emissions Bus Transition Plan

Cover Page Photo Reference:

Henn, Hannah. *MCDOT Rolls Out First Four Electric Buses on Ride On; Accelerates Efforts to Reduce Transportation Emissions and Build a Greener County.* Image. MCDOT. September 3, 2020. https://www2.montgomerycountymd.gov/mcgportalapps/Press Detail.aspx?Item ID=26754&Dept=50.

Final – May 2022

Agency Contact Information

Transit Agency's Name	Montgomery County Department of Transportation	
Mailing Address	101 Monroe Street, Rockville, MD 20850	
Transit Agency's Service Area	Bethesda-Chevy Chase, Eastern Montgomery, Mid-County, Silver Spring and Up County	
Total Number of Buses in Annual Maximum Service (2021)	376	
Urbanized Area	Silver Spring – Bethesda – Rockville - Gaithersburg	
Population of Urbanized Area (2020)	1,062,061	
Contact Information of Chief Officer	Dan Hibbert 240-777-5800 Dan.Hibbert@montgomerycountymd.gov	

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MCDOT - Zero Emissions Bus Transition Plan

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Acronyms

APP Area of Persistent Poverty

BEB Battery Electric Bus

BRT Bus Rapid Transit

EaaS Energy as a Service

EEA Equity Emphasis Area

CNG Compressed Natural Gas

DRPT Department of Rail and Public Transportation

EMTOC Equipment Maintenance and Transit Operating Center

EPA Environmental Protection Agency

FFV Freedom Fleet Voucher

FHWA Federal Highway Administration

FTA Federal Transit Administration

FY Fiscal Year

GHG Greenhouse Gas

HDC Historically Disadvantaged Community

ICE Internal Combustion Engine

MCDOT Montgomery County Department of Transportation

MCGEO Municipal and County Government Employee Organization

MWCOG The Metropolitan Washington Council of Governments

NTD National Transit Database

OEM Original Equipment Manufacturer

OPT Office, Professional and Technical

ORESJ Office of Racial Equity and Social Justice

PPP Public-Private Partnership

QA/QC Quality Assurance/Quality Control

RFP Request For Proposal

MCDOT - Zero Emissions Bus Transition Plan

SLT Service, Labor and Trades

SOC State Of Charge

SUV Sport Utility Vehicle

TPB Transportation Planning Board

TSP Transit Strategic Plan

WMATA Washington Metropolitan Transit Authority

ZEB Zero-Emission Bus

ZEV Zero-Emission Vehicle

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1 Executive Summary

Policies, Goals and Needs

This commitment by the Montgomery County Department of Transportation (MCDOT) to a zero-emission bus (ZEB) fleet is in direct alignment with the agency's three priority areas:

- Safety and Vision Zero
- Environment and Climate Resiliency
- Economic Development and Equitable Access

Transition Plan Structure

MCDOT is structuring its fleet transition in close coordination with bus storage and maintenance facility development and upgrades. A concurrent bus network redesign is informing (and being informed by) the zero-emission transition.

Fleet Transition Schedule and Milestones

Figure 1-1 outlines the potential fleet procurement and composition to reach 100 percent ZEB fleet by 2035 to meet the County's Climate Action Plan goals, as well as the key milestones MCDOT is forecasting regarding facility and infrastructure upgrades. Based on current projections and modeling:

- By the end of 2027, nearly 50 percent of the Fixed Route fleet will require replacements by ZEBs.
- By 2030 over 80 percent of the Fixed Route fleet will be ZEB, and by 2035 the entire fleet will be transitioned.
- The On-demand fleet is expected to be fully electric by 2027.

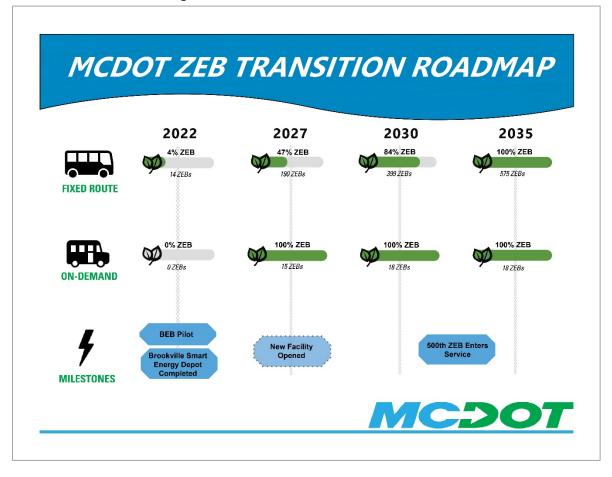


Figure 1-1: MCDOT Zero Emissions Fleet Plan

Zero-Emission Transition Plan Requirements 🔽

This Transition Plan satisfies the FTA minimum requirements for the Low-No and Bus and Bus Facility discretionary grant applications. This plan:

- Demonstrates a long-term fleet management plan Section 6
- Addresses the availability of current and future resources Section 10
- Considers policy and legislation impacting relevant technologies Section 3
- Includes an evaluation of existing and future facilities Sections 4 & 7
- Describes the County's partnerships with utilities and fuel providers Section 5
- Examines the impact of the transition on the applicant's current workforce Section 9

2 Transit Agency Overview

History

Montgomery County's Department of Transportation Division of Transit Services serves the most heavily populated county in the state of Maryland with over one million residents across 510 square miles. Montgomery County neighbors Washington, D.C. and is bordered by the Potomac River to the west.

MCDOT owns and operates almost 400 buses providing Montgomery County residents with reliable transit options and resources. The MCDOT transportation systems coincide with other systems in the region, namely, the Maryland Departments of Transportation (MDOT) and the Washington Metropolitan Transit Authority (WMATA). MCDOT works closely with these agencies to ensure transportation efficiency for all users.

The County's bus system is referred to as Ride On. The Ride On system is divided into other subsets that serve specific purposes. Starting in 1975, Ride On has been the fixed route transit line serving neighborhoods across Montgomery County. Implemented on October 2, 2017, Ride On Extra is a limited stop service operating on MD 355. This line has 13 stops to provide faster service between Lakeforest Transit Center and Medical Center Metro Station and only runs during peak periods. Ride On Flex is a microtransit service that operates within the Rockville and Glenmont/Wheaton zones. Ride On Flex has no fixed stops or schedules and is designed for those trips originating and ending within a single zone. The service is initiated when a ride is booked either through the Ride On Flex mobile app or by contacting the local call center directly. Introduced in 2020, FLASH is the first bus rapid transit (BRT) service in the state. FLASH serves the Colesville Road/Columbia Pike Corridor with buses arriving every 15 minutes or less.

Montgomery County is divided into five service areas: Bethesda-Chevy Chase, Eastern Montgomery, Mid-County, Silver Spring and Up County. Ride On operates 79 bus routes in these service areas out of three bus depots. Most Ride On routes serve at least one of the 13 Metro stations and 8 MARC stations in the county. Typical weekday service runs from about 5:00 AM until midnight with some routes starting as early as 4:25 AM and ending at almost 2:00 AM. All routes operate during weekday rush hour with varying service levels throughout the rest of the day. Weekend service is limited to 47 routes in operation on Saturdays and 37 routes in operation on Sundays. Modifications to bus service schedules are typically made three times per year in January, May, and September.

In FY 2020, Ride On weekday services averaged 2,689 daily revenue hours of service and carried 80,743 passengers. Due to the COVID-19 pandemic annual ridership has decreased in recent years. In FY 2021 there was a decrease of 20.8 percent and average weekday ridership of 53,287. In addition to the pandemic, gasoline prices, government shutdowns, telecommuting, Metrorail service problems and the aging population also contribute significantly to the ridership volumes in Montgomery County. The aging population contributes to ridership in two ways. First, senior riders represent a growing ridership group who utilize bus transportation to safely get around. Secondly, the aging population results in a decline in the working age population who use the bus service more frequently then senior citizens.

Despite the recent struggles of the COVID-19 pandemic, Ride On service has shown an upward trajectory of ridership since March 2020. Ridership has progressively increased and has caused MCDOT to restore most of its pre-pandemic service routes. As of <u>March 2022</u>, bus service has been restored to 86 percent of pre-COVID levels. It is expected that ridership will continue to increase as the working population returns to an in-person working environment and COVID protocols continue to diminish.

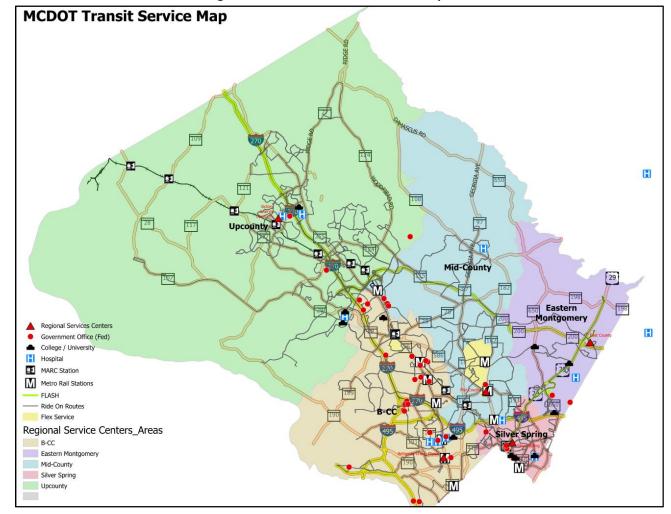


Figure 2-1: MCDOT Transit Service Map

Vision and Mission

MCDOT aims to improve transportation and connect the people within the County without having an adverse effect of the environment. The vision and mission of MCDOT is listed below.

- MCDOT's Vision: A seamless transportation system for people of all ages, incomes and abilities that supports a vibrant and sustainable community.
- MCDOT's Mission: To move people and connect places with the best transportation choices and services.

Priority Areas

MCDOT has identified three main priority areas that guide the agency's focus and advance its mission to move people and connect places with the best transportation choices and services. Moreover, MCDOT has recognized the importance of embracing sustainability in its operations, especially as an emphasis on slowing or reversing climate change has become more prevalent and legislative guidelines have become

more pressing. Simultaneously with changes in the regulatory environment, market conditions for Zero-Emission bus products have also changed, with many more product types available and at lower costs than could be previously offered. Due to these converging conditions, MCDOT recognizes now is the right time to move forward with a transition to a zero-emission bus (ZEB) fleet to serve its ridership. This commitment by MCDOT to a ZEB fleet is in direct alignment with the agency's three priority areas as described below.

Safety and Vision Zero

Safety is an integral part of MCDOT's mission and is at the forefront of the everyday activities of the agency. MCDOT aims to create a safe environment for transportation of all types for the residents of Montgomery County. MCDOT has an abundance of safety programs in place to help create safe conditions. Vision Zero is an action plan that aims to eliminate all serious and fatal collisions for drivers, passengers, pedestrians, and bicyclists in MCDOT roadways by the year 2030. The action plan highlights safety initiatives with deadlines for implementation which drives the actions and decision making of Montgomery County to meet this goal of ending fatalities.

ZEB Linkage: Providing safe and sustainable non-auto travel options will support Vision Zero goals by helping to reduce traffic congestion and collisions

Environment and Climate Resiliency

In June 2021, Montgomery County finalized their <u>Climate Change Action Plan</u>. This is an aggressive plan that outlines strategies and actions to reduce greenhouse gas emissions and adjust to the changing

ZEB Linkage: ZEB utilization will directly support the environment and climate resiliency, as ZEBs do not emit the greenhouse gases or particulate matter that their combustion engine counterparts do. This will have the effect of reducing carbon emissions and improving local air quality. Moreover, quieter operating ZEBs may contribute to reductions in transit-associated noise levels.

environment. MCDOT is supporting the efforts of the Climate Change Action Plan by pledging to a zeroemission bus fleet by the year 2035. MCDOT is committed to meeting this goal and link efficient transportation systems with low environmental impacts. The County is also committed to replacing its transit infrastructure with zero emission systems and designing and building net zero facilities, which will contribute to the environment and climate resiliency goals by lowering greenhouse gas emissions and having a minimal impact on the environment.

Economic Development and Equitable Access

Montgomery County is the most populous county in Maryland and is located adjacent to Washington, D.C. As of the 2020 census, the county's population was 1,062,061, increasing by 9.3 percent from 2010. Jobs within the region will grow alongside the population creating the opportunity for economic growth. Reliable transportation is an integral component of the success of the region's economy by connecting people with jobs, services, and businesses. MCDOT strives to incorporate the needs of the community into decision-making to improve transit systems and transportation access with equity in mind. For the zero-emission transition, an important objective is to deploy the new, cleaner technologies across different parts of the Ride On service area focusing on equity emphasis areas (EEA) with lower income and historically disadvantaged communities. This will ensure that the needs of the growing population are considered to create the best services for the present community and that of the future.

ZEB Linkage: With a management system in place, operations and maintenance (O&M) costs for transit agencies could be lower for ZEBs than with combustion engine buses, as there are fewer parts requiring frequent maintenance. When agencies can provide the same service with less funds, there is greater opportunity to enhance system services for the community, and enhanced services may have the effect of increasing employment opportunities. Implementing ZEB service in equity emphasis areas for disadvantaged communities is an opportunity for MCDOT to contribute to local and regional equity. Disadvantaged communities often rely on public transit as their primary means of transportation. ZEBs reduce exposure to harmful emissions that result in negative health outcomes while also connecting these communities to jobs, services, and businesses.

Guiding Principles

MCDOT has established the following guiding principles that drive the organization:

- Provide an effective and efficient transportation system
- Keep our system reliable, safe, and secure
- Engage and support our diverse community
- Enhance quality of life
- Be innovative and forward-thinking

The transition to ZEBs supports these principles because, as explained above, ZEBs are part of an innovative approach to public transit that offers safe, effective, and quiet rides, serving the diverse community of Montgomery County. ZEBs provide the same level of service to the community as diesel buses, while also supporting a healthy environment. The transition to ZEBs is also forward-thinking and moves MCDOT into sustainable technology of the future.

Zero-Emission Vehicle Technology Benefits

Transitioning to zero-emission technology has numerous potential benefits to the region as described in **Table 2-1.** MCDOT is committed to actualizing these potential regional benefits to the greatest extent possible.

Table 2-1: Zero-Emission Vehicle Benefits

Categories		Benefits
	Economic Competitiveness	 Reduce operational costs through savings from lower fuel and maintenance costs Advance potential workforce development
دُع	Environmental	 Avoid tons of carbon emissions and pounds of nitrogen oxide emissions
%	Health	 Reduce noise levels Decrease potential respiratory issues like asthma and allergies, and other air quality-related health exposure
1000	Equity	 Offer equity integration strategies Support sustainable transit systems growth to improve connectivity
	Safety and Security	 Reduce dependency on fossil-based sources Offer sustainable micro grid concept Create more secure operations due to less outside energy dependency
©	Other	 Optimize energy consumption through regenerative breaking Improve vehicle acceleration Enhance customer experience

3 Clean Transit Regulations



Consider policy and legislation impacting relevant technologies

Montgomery County has been a national leader in responding to the challenge of climate change and implementing clean transit regulations. In December 2017, Montgomery County adopted the Montgomery County Council Emergency Climate Mobilization Resolution 18-974. This resolution set the objective to reduce greenhouse gas (GHG) emissions by 80 percent by 2027 and 100 percent by 2035. Resolution 18-974 aligns with MCDOT's goal to transition to ZEB by 2035. Additionally, there are multiple Federal and State incentives and regulations that encourage MCDOT to make the transition to ZEB.

Federal Transit Administration Regulation

Background

On December 1, 2021, the <u>FTA announced the Zero-Emission Plan</u> requirement as now part of the implementation of the Grants for Buses and Bus Facilities Competitive Program and the Low or No Emission Program. Under this mandate, any applications for projects related to zero-emission vehicles must include a Zero-Emission Transition Plan.

Zero-Emission Transition Plan Requirements

A Zero-Emission Transition Plan must, at a minimum:

- Demonstrate a long-term fleet management plan with a strategy for how the applicant intends to use the current request for resources and future acquisitions.
- Address the availability of current and future resources to meet costs for the transition and implementation.
- Consider policy and legislation impacting relevant technologies.
- Include an evaluation of existing and future facilities and their relationship to the technology transition.
- Describe the partnership of the applicant with the utility or alternative fuel provider.
- Examine the impact of the transition on the applicant's current workforce by identifying skill gaps, training needs, and retraining needs of the existing workers of the applicant to operate and maintain zero-emission vehicles and related infrastructure and avoid displacement of the existing workforce.

State Legislation

Within Maryland

In July 2020, Governor Hogan signed Maryland into the Multi-State Zero Emission Medium- and Heavy-Duty Vehicle Memorandum of Understanding. This is a 15-state commitment to work together to phase out fossil fuel usage for electric medium- and heavy-duty vehicles, including large pickup trucks and vans, delivery trucks, box trucks, school and transit buses, and long-haul delivery trucks (big-rigs). The goal is to ensure that 100 percent of all new medium and heavy-duty vehicle sales be zero emission vehicles by 2050 with an interim target of 30 percent zero-emission vehicle sales by 2030. Montgomery County's neighboring jurisdictions, Virginia and Washington D.C., are also signed into this Memorandum of Understanding.

Governor Hogan signed Maryland into the <u>United States Climate Alliance</u>. This multi-state partnership of governors' pledges to reduce carbon emissions in line with the Paris Agreement. Specifically, each member state commits to "reducing collective net GHG emissions at least 26 percent-28 percent by 2025 and 50 percent-52 percent by 2030, both below 2005 levels, and collectively achieving overall net-zero GHG emissions as soon as practicable, and no later than 2050."

Other States

Eight states have currently enacted legislation or funding requirements mandating the conversion of public transit fleets to ZEB by 2040, as well as systemically banning the procurement of internal combustion engine (ICE) vehicles as soon as 2023.

It has become important for transit agencies to understand ZEB technology, its specifics, the way it will affect transit buses' current operations, staff and key personal and work on the solutions that could be implemented to keep the same efficiencies as using diesel buses in their current operating environment. Advancements in bus propulsion technologies continue to provide transit providers with a diverse range of green technology options which can benefit them in the future.

National Incentives

Build Back Better Bill

President Biden's Build Back Better framework features incentives as large as \$12,500 per vehicle for buying EVs. The bill features an Executive Order that sets a new target of ZEVs representing half of all new vehicles sold by 2030. The Executive Order also introduces long-term fuel efficiency and emissions standards and sets a schedule for these standards through at least model year 2030 for light-duty vehicles and for medium- and heavy-duty vehicles starting as early as model year 2027.

4 Bus Electrification Program



Evaluation of existing and future facilities

MCDOT's Ride On Brookville Smart Energy Depot is located in Silver Spring, Maryland. The depot is used as a service, storage, and maintenance facility for vehicles in the Ride On bus fleet. MCDOT partnered with AlphaStruxure to design, build, own, operate and maintain the depot energy systems. This business model, known as Energy as a Service (EaaS) business model, delivers long-term cost certainty, sustainability, reliability, and resilience backed by a performance-based energy service agreement. In September 2021, Montgomery County broke ground on their bus electrification program. The bus depot includes a microgrid solar energy project as the power sources for MCDOT's growing electric bus fleet. A microgrid is an independent local energy grid that can operate separately from a traditional grid. The microgrid has a capacity of approximately 105 buses supported in island mode, with no support from the utility provider's grid. There is a grid connection to the site that will allow electrification above 70 buses, however, resiliency will be limited to operating on an "S" schedule. In addition to the microgrid, the Ride On Brookville Smart Energy Depot project will include:

2 megawatts (MW) of solar photovoltaic canopies that will provide electrical power to the buses and to the battery storage systems

- 4.3-megawatt hours (MWH) battery storage
- 2 MW of natural gas generation
- Microgrid controllers

EV Smart Grid Depot Design
1 Solar Panels
2 Electric Bus Chargers
3 Battery Storage
4 Natural Gas Generators

Figure 4-1: Microgrid controllers Site Plan – Equipment Layout

The upgrade of Phase I of the Brookville Smart Energy Bus Depot is scheduled to be completed by Summer 2022. The facility will service four electric buses that were added to the bus fleet in September 2020 and 10 more that have been ordered as of February 2022. Upon completion, the Brookville Smart Energy Bus Depot will support the County's goal of net zero carbon emissions by 2035 and deliver the following benefits:

- Bus Electrification
- Environmental Sustainability (cut carbon emissions by 62 percent)
- Climate Resilience and Operational Reliability
- Flexible Fleet Operations
- Economic Development (the creation of >50 construction jobs)

5 Technology Portfolio



Describe the County's partnerships with utilities and fuel providers

Utility Provider

The Potomac Electric Power Company (Pepco) is the utility provider for Washington, D.C., and neighboring Maryland communities, including Montgomery County.

Pepco's EVSmart Program supports the use of electric vehicles by providing savings, incentives, and rebates to electric vehicle owners across their service area. In 2019, Pepco also launched a public charging network in Prince George's and Montgomery counties. This charging network will provide 250 Pepco-

owned Level 2 smart chargers or DC fast chargers across the Pepco service area giving electric vehicle owners increased accessibility to charging sources.

While MCDOT's partner, AlphaStruxure, deploys the Brookville Smart Energy Bus Depot integrated microgrid, Pepco has provided critical support. The microgrid's lithium-ion battery system will participate in Pepco's Demand Response Program that will support regional grid performance and optimization for greater energy resilience overall.

MCDOT recognizes that the transitioning of vehicle fleets to zero emissions across the nation is creating rapid changes in market demand and significant challenges for utility companies and are committed to continuing their successful partnership with Pepco and other local utilities through active communication and planning.

Future Zero Emission Strategies

MCDOT is exploring the addition of hydrogen fuel cell buses to their fleet as another technology option along with BEBs. Hydrogen can be used to generate energy through electrochemical reaction. Hydrogen and oxygen are combined in a fuel cell to generate electricity, heat, and water. Fuel cell buses (FCBs) are another ZEB technology option that are as ecofriendly as BEBs. FCBs require refueling practices similar to CNG and offer range comparable to conventional buses, although the adoption of FCBs would require extensive infrastructure upgrades for hydrogen storage and fueling stations. While electric buses require similar extensive infrastructure upgrades, with hydrogen infrastructure the cost per bus declines as the fleet expands, in contrast to electric charging.

MCDOT acknowledges that hydrogen is basically an "energy carrier" and using hydrogen is ecofriendly only if it is produced using renewable methods, such as solar or wind, which are so-called "green hydrogen" sources. Most of the hydrogen presently produced uses steam reformation of methane (SRM), and this method is a significant source of carbon dioxide. MCDOT is planning for the incorporation of a new green hydrogen fuel production and fueling station into its infrastructure to serve the hydrogen fuel cell buses fleet, which will be greener than traditional fossil fuel-based hydrogen production, as the hydrogen fuel will be produced from water, using zero-emission electrolysis.

6 Current Fleet and Future Acquisitions



Demonstrate a long-term fleet management plan

Current Bus Fleet

As of March 2021, MCDOT owns and operates nearly 400 buses. The current bus fleet is made of up a combination of diesel, hybrid, CNG and electric buses. The county owns 120 40-foot diesel buses, 53 40-foot hybrid buses, 95 40-foot CNG buses, 81 30-foot diesel buses, four 35-foot electric buses, 16 60-foot BRT diesel and seven 25-foot on demand vehicles. MCDOT is awaiting the delivery of ten additional electric buses by the Summer of 2022. MCDOT's fleet has an assorted mix of model years, dating as far

back as 2009, and replacement milestones, reaching as far as 2033. Most of the current bus fleet is GILLIG bus make. **Figure 6-1** presents a summary of MCDOT's existing fleet as of March 31, 2021.

Figure 6-1: Ride On Fleet Composition

Year	Manufacturer	Fuel	Length	Cameras	Lift	Estimated End of Useful Life	Fleet Inventory 1/1/2022
2009	Gillig	Diesel	40	Yes	Low-Entry	2021	10
2009	Gillig	Hybrid	40	Yes	Low-Entry	2021	35
2011	Gillig	Hybrid	40	Yes	Low-Entry	2023	12
2011	Gillig	Diesel	40	Yes	Low-Entry	2023	1
2012	Gillig	Hybrid	40	Yes	Low-Entry	2024	7
2013	Gillig	Diesel	40	Yes	Low-Entry	2025	12
2013	Gillig	Diesel	30	Yes	Low-Entry	2023	28
2014	Gillig	CNG	40	Yes	Low-Entry	2026	19
2014	Gillig	Diesel	30	Yes	Low-Entry	2024	32
2016	Gillig	Diesel	40	Yes	Low-Entry	2028	24
2016	Gillig	CNG	40	Yes	Low-Entry	2028	1
2016	Gillig	CNG	40	Yes	Low-Entry	2028	15
2016	Gillig	Diesel	40	Yes	Low-Entry	2028	16
2016	Gillig	Diesel	30	Yes	Low-Entry	2026	1
2017	Gillig	CNG	40	Yes	Low-Entry	2029	34
2017	Gillig	Diesel	40	Yes	Low-Entry	2029	25
2018	Gillig	Diesel	40	Yes	Low-Entry	2030	0
2018	Gillig	CNG	40	Yes	Low-Entry	2030	4
2019	Gillig	CNG	40	Yes	Low-Entry	2031	23
2019	Gillig	Diesel	40	Yes	Low-Entry	2031	3
2019	Gillig	Diesel	40	Yes	Low-Entry	2031	9
2019	Gillig	Diesel	30	Yes	Low-Entry	2029	19
2019	Ford	Microtransit	29	Yes	Yes	2023	7
2020	Nova	Diesel	60	Yes	Level Boarding	2032	16
2020	Proterra	Electric	35	Yes	Low-Entry	2032	4
2021	Gillig	Diesel	30	Yes	Low-Entry	2031	20

Source: MCDOT Fleet Inventory from FY23-FY28 Replacement Plan, dated 3/15/2022

Bus Replacement Schedule

Figure 6-2 outlines the potential fleet procurement and composition to reach 100 percent ZEB fleet by 2035. This model considers replacement eligibilities and assumes that all replacement buses purchased moving forward will be ZEB. MCDOT provided the planned replacements for FY2023 through FY2028 as established for the CIP; these replacements were directly added to the model. Future fleet replacements are assumed to occur one year after the end of a vehicle's useful service life; the additional year accounts

for the time required for vehicle procurement and delivery. Useful service life by vehicle type reflects FTA standard useful service life figures¹, except for the existing fleet of 60' NOVA buses which are accruing mileage more rapidly than anticipated and will reach their end of life after 10 years.

With these assumptions in mind, by 2027 nearly 50 percent of the Fixed Route fleet will be ZEB. By 2030 over 80 percent of the Fixed Route fleet will be ZEB and by 2035 the entire fleet will be transitioned. In addition to the replacement buses, MCDOT identified the planned acquisition of 216 additional vehicles before 2035; much of this is due to the several planned BRT service expansions. As a result, the total fleet size will grow from 377 buses to 593 buses. These additional buses will also be electric and will result in a 100 percent ZEB fleet composed of 593 total buses by 2035.

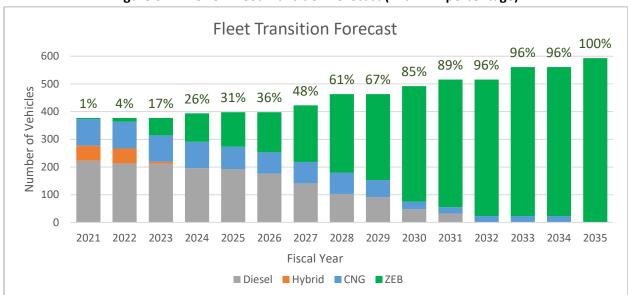


Figure 6-2: MCDOT Fleet Transition Forecast (with ZEB percentage)

Past and Future ZEB Feet Procurements

As mentioned, MCDOT added four electric buses to the bus fleet in September 2020 with ten more on order as of February 2022. Additionally, MCDOT plans to issue an RFP for an additional 86 BEBs in the Spring of 2022. This brings the planned total to 100 BEBs in the Ride On fleet. MCDOT is committed to transitioning its entire transit fleet to ZEBs to achieve zero emissions by 2035.

The <u>Recommended FY23 Capital Budget and FY23-FY28 Capital Improvement Program (CIP)</u> includes \$1.29 billion in spending on projects to address climate change. This climate related spending consists of \$655 million to reduce climate impact in mass transit across the county. This includes \$155 million to support the transition to a zero emission Ride On fleet. The CIP recommends over \$40 million across FY23-FY24

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¹ Microtransit buses: 4 years; Small buses (30'): 10 years; Large buses (35-40'): 12 years.

for the procurement of electric buses. These added bus purchases will allow the Brookville Smart Energy Bus Depot microgrid to be utilized to its full capacity.

7 Facilities and Infrastructure Plans



Evaluate existing and future facilities

Current Facilities

MCDOT currently has three facilities to operate and maintain the fleet: Brookville Smart Energy Depot, the Equipment Maintenance and Transit Operating Center (EMTOC), and Nicholson Court Depot. Brookville Smart Energy Depot supports diesel, hybrid and electric buses with a capacity of 140 buses. EMTOC currently supports diesel and CNG buses and holds a capacity of 200 buses. EMTOC will require upgrades to support the transition of the bus fleet. Nicholson Court Depot has a capacity of 67 buses and can support diesel fueled buses. A summary of the current conditions of the facilities are presented in the **Table 7-1**.

Total Main **Requires Facility Name Address** Fuel Type(s) Bus **Functions Upgrades** Capacity 8710 Brookville Rd. **Brookville Smart** Diesel, Silver Spring, MD **0&M** 150 Underway **Energy Bus Depot** Electric, Hybrid 20910 Equipment 16700 Crabbs Branch Maintenance and Diesel, 200 Way 0&M Yes **Transit Operating** CNG Rockville, MD 20855 Center (EMTOC) Leased facility and it will not be upgraded; 4925 Nicholson it will be **Nicholson Court** Court replaced with 0&M Diesel 65 **Depot** Kensington, MD a zero 20895 emissions facility at a different location

Table 7-1: Existing Bus Facilities Summary

Facility Upgrades and Modifications

Facility modifications are essential to the transition to ZEB. This would include the eventual decommissioning of diesel equipment, enhancements to and expansions of electrical equipment, additional electrical supply, and the installation of BEB chargers, dispensers, fire suppression

enhancements and other components, in addition to any other infrastructure and equipment that might be necessary to support hydrogen fuel cell buses.

Brookville Smart Energy Bus Depot modifications are underway and highlighted in Section 3. Hydrogen infrastructure is currently planned to be added to this facility.

The Equipment Maintenance and Transit Operating Center (EMTOC) located in Gaithersburg has a current capacity for 200 buses. The site comprises 5 buildings serving the MCDOT's Divisions of Transit Services, Highway Services, and the MCDGS's Division of Fleet Management. Modifications to EMTOC will need to include utility infrastructure and on-site electrical. Hydrogen fueling infrastructure is also being planned for addition at this facility.

The Nicholson Court Depot is in the White Flint area, and it is not County owned. The lease for this facility expires in 2027. A new maintenance facility will be required to replace Nicholson Court as well as accommodate fleet growth primarily through the expansion of BRT service with a capacity of 150 to 250 buses including bus bays, parking for articulated buses appropriate zero-emission vehicle fueling capabilities. Since the Nicholson Court Depot is not owned by the County, it is not suitable for ZEB investments and facility modifications in its existing condition.

On-Route Charging

On-route charging may be needed for MCDOT ZEB full transition. On-route charging may assist in extending ranges to meet service requirements and reduce charging times at bus facilities. The location and technology of the on-route chargers should be determined by modeling routes and energy consumption for the Ride On service. These locations have not yet been identified. An implementation study is currently underway to identify these potential on-route charger locations, estimate power consumption, coordinate utility improvements, and develop preliminary designs and budget estimates.

8 Service to Disadvantaged Communities

The Montgomery County community is made up of a blend of various income levels, races, education levels, religions, and ages. The disparities within the community make it vitally important for the County to emphasize equity in all decision-making to evoke a change. Montgomery County's Office of Racial Equity and Social Justice (ORESJ) was created in December 2019 with a mission to reduce and eliminate racial disparities and inequities across the county. As a County priority, the ORESJ brings issues related to race and equity to the forefront to promote transformational change. The County's ORESJ initiatives incorporate various programs, initiatives and guidelines as described below.

Ride On Reimagined

The County is committed to ensuring that the implementation of ZEBs and related facility-based initiatives support the goals and objectives of the Ride On Reimagined study, which will be the primary means of advancing the mission of the ORESJ throughout the transition to zero emissions. This is an on-going effort to be completed by 2023 and is a comprehensive forward-looking assessment of the bus network that may result in significant recommended changes to how transit operates in Montgomery County based on future and current needs. This study will take an in-depth look at Montgomery County's entire existing and planned transit system, including Metrobus services that operate within the County limits and the

future Purple Line. The study would also provide an opportunity to guide the future direction of Ride On through data analysis and community engagement and will have a primary goal of recommending systemwide changes that address the current and future needs of the community it serves for both Ride On and Metrobus services.

The Ride On reimagined study will examine the current conditions and anticipated future of Ride On's service area, and will engage community leaders, activists, transit riders and support organizations to form a foundation of travel options. A full evaluation will be conducted to evaluate route structure, connectivity, span, and frequency of service through market research and analysis, review of land use development and anticipated technology advancements. The study will also address the County priorities to improve racial equity and prevent climate change. The image of transit services is important to attract riders; therefore, an internal and external evaluation of Ride On's brand will be examined. Ride On Reimagined will set the framework for a plan with recommendations and implementation strategies that best align with the goals of the County's overall transportation network.

Metropolitan Washington Council of Governments

The Metropolitan Washington Council of Governments (MWCOG) and Transportation Planning Board (TPB) have identified Equity Emphasis Areas (EEAs) to inform equitable future growth and investment decisions. These EEAs are made of areas with high concentrations of low-income individuals and/or racial and ethnic minorities. MWCOG and the TPB use EEAs as selection criteria in their grant programs including alternative modes of travel. As seen in **Figure 8-1** the current Ride On routes serve multiple EEAs across Montgomery County. The three current bus maintenance facilities fall in or are adjacent to EEAs; the conversion of existing combustion engine operations to ZEB operations will directly benefit the communities in the vicinity of these facilities not only by providing increased access to public transit, but also by way of a reduction in noise and emissions.

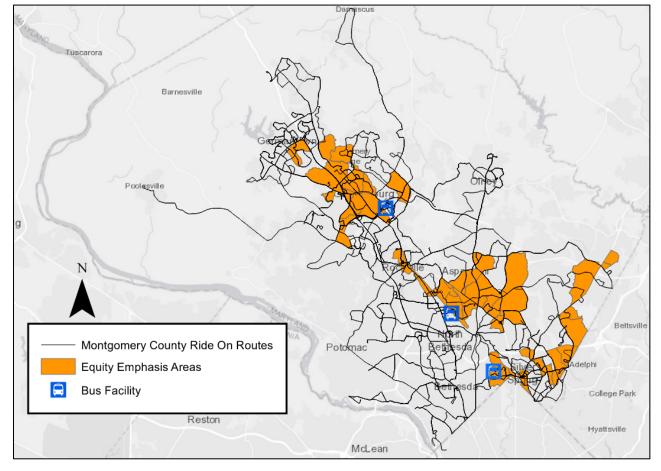


Figure 8-1: Ride On Routes in Equity Emphasis Areas

Justice40

The Biden-Harris Administration named racial equity and addressing the climate crisis as immediate priorities and called on a whole-of-government approach to address two of the most important and urgent challenges of our time. These issues are related and often intersecting. So, the Administration created the <u>Justice40</u> Initiative which aims to deliver 40 percent of the overall benefits of federal investments in climate and clean energy, including sustainable transportation, to disadvantaged communities. MCDOT is committed to incorporating Justice40's guidelines into its ZEB transition plan by developing a framework centered on racial justice and equity in its investments.

USDOT Guidance

The USDOT defines an area as a "Area of Persistent Poverty" (APP) if:

- The County in which the project is located consistently had greater than or equal to 20 percent of the population living in poverty in all three of the following datasets: the 1990 and 2000 census and the 2020 Small Area Income Poverty Estimates
- The Census Tract in which the project is located has a poverty rate of at least 20 percent
- The project is in any territory or possession of the United States.

The USDOT defines an area as a "Historically Disadvantaged Community" (HDC) if:

- The project is in certain qualifying census tracts
- The project is located on Tribal land
- The project is in any territory or possession of the United States.

Based on the <u>DOT Persistent Poverty Project (APP) and Historically Disadvantaged Community (HDC) Status Tool</u> there are 45 census tracts within Montgomery County that qualify as historically disadvantaged communities and 6 tracts that qualify as both areas of persistent poverty and as historically disadvantaged communities.

Residents of EEAs, APPs, and HDCs are generally among the most vulnerable populations. The residents of these communities often rely on public transit as their primary means of transportation. They are also more frequently exposed to harmful emissions and pollutants that result in negative health outcomes.

Implementing and prioritizing a ZEB service in disadvantaged communities is an exciting opportunity for MCDOT to contribute to local and regional equity.

9 Workforce



Examine the impact of the transition on the current workforce

Workforce Environment

The County's workforce is structured based on the Office, Professional and Technical (OPT) and Service, Labor and Trades (SLT) Collective Bargaining Agreement with the Municipal & County Government Employees Organization/United Food and Commercial Workers Union Local 1994 (the Union). Based on this agreement, upon completion of the probationary period, all Montgomery County Government employees in union-covered positions, apart from police officers, are eligible to join the labor organization that represents them. Police officers do not complete a probationary period and are members of the bargaining unit as of their hire date.

Staff that work in positions related to the County's transit fleet, employed in a non-supervisory, non-managerial or non-confidential job, are represented by one of the following Unions:

- Office, professional, technical, and paraprofessional (support personnel) employees are represented by the Municipal and County Government Employee Organization (MCGEO), United Food and Commercial Workers, Local 1994.
- Ride-on bus operators, facilities, and maintenance workers, those who possess specialized
 manual skills, and others who perform duties that result in or contribute to the comfort and
 convenience of the Public are also represented, but by the Service, Labor and Trade Unit of
 MCGEO, Local 1994.

Through their collective bargaining agreement, the County and the Union jointly acknowledge the responsibility to foster a positive labor relations environment based on mutual trust, respect, and cooperation, in the hope that this contributes to the establishment of a healthier and more productive workplace for the employees and the greater success of the ZEB transition. The key goals of this partnership are the delivery of quality public services to the residents and employees of Montgomery County, along with enhanced employee compensation, job security and a positive work environment for all.

Workforce Training

The transition to ZEBs will impact MCDOT's and Montgomery County Department of General Services' (MCCDGS's) service and operations at all ranks of the organization. The initial fleet addition of BEB vehicles from two different OEMs, combined with the development of the Brookville Smart Energy Bus Depot project, represent initial electrification projects that illustrate how managers and staff will adapt during the systematic transition to zero-emission operation.

MCDOT and MCDGS recognize that the transition will require extensive changes in route optimization, vehicle operation characteristics, energy management, servicing operations, and training. As these changes affect the availability and need of existing positions, the County will make every effort to offer any affected employee comparable positions to the ones they held at the time these new equipment and technologies are implemented with the intention to avoid the elimination of positions or demotions. If the changes in technology significantly alter the essential tasks and skills of a job, the County will provide a reasonable amount of training so the incumbent can obtain the requisite skill to continue to hold their position. If employees affected by new technology are not qualified for and cannot be trained to perform the duties of the revised position, the County will make reasonable efforts to place the employee in a vacant position for which they are qualified.

Equitable access to training will be provided by the original equipment manufacturer (OEM), MCDOT and MCDGS and outside organizations to retain, retrain and recruit employees into good jobs and provide adequate support to help workers to stay in their jobs. The following provides a list of personnel and positions that will need to be retrained upon further adoption of ZEBs (this list is not exhaustive):

Bus Technicians

Bus technicians will need to be familiarized with the ZEB system components, safety, operations, and charging procedures. New standard operating procedures, tools, and safety equipment will be required for some routine inspections, preventative inspection/repair work, and during major repairs. Fall protection systems are currently provided at each shop location to maintain any rooftop mounted equipment on board the bus. These systems will also be utilized for maintaining roof-mounted ZEB components. Administration of systems troubleshooting, and repair training should be based upon the employee's skill level. Incremental levels of training are necessary to properly match the type of work performance assigned to each group. While additional training will be necessary, bus technicians at the Brookville Smart Energy Bus Depot have previous experience supporting high-voltage electrical systems (hybrid buses) and those at EMTOC have experience supporting gaseous fuel technologies (CNG).

Bus Operators

Bus operators will need to be familiarized with ZEB safety and general operation. BEB operators should be trained on how to understand and use readings such as battery SOC, remaining operating time,

estimated range, and other system notifications that may occur during operation. One additional area of focus for operator training will be the use of the accelerator pedal to accelerate and to decelerate. The accelerator pedal response on ZEBs will be different than conventional engine equipped buses and the operators can have a huge effect on energy consumption and regenerative braking efficiencies. Emphasis must be given to operators regarding the regenerative braking capability and its significant impact to ZEB range and performance. FCBs operate like hybrid buses. Bus operators already familiar with hybrid bus operation will not require any additional training.

Facilities Maintenance Staff and Maintenance

Facilities staff will need to be instructed with scheduled and unscheduled repairs, high-voltage systems, and the specific maintenance and repair of equipment. Detailed maintenance of complex systems may require additional specific training for systems such as high voltage charging systems.

The new technology required for charging batteries and fueling with hydrogen will require detailed and specific training for the facilities maintenance staff. New standard operating procedures, tools, and safety equipment will be required for some routine inspections, preventative inspection/repair work, and during major repairs. For working with high voltage equipment, special training will be required to meet the safety guidelines recommended by the National Fire Protection Association.

Future charging equipment and/or hydrogen fueling stations will have warranty provisions as part of the contract, and training will be included. Both electric charging infrastructure and hydrogen equipment will be managed by a third party. Staff will be trained on how to safely operate and interface with the equipment, however they will not need maintenance training.

First Responders

Local police and fire station staff will need to be familiarized with the new buses and supporting facilities. High voltage batteries and high-pressure gas cylinders have been equipped on the County's vehicles for well over a decade, and as more are being introduced, efforts by first responders to become aware of how to respond to incidents have been ongoing. As the transition to full ZEB operation progresses, first responder training will continue to be a focal point for fire fighters, police, and other safety personnel, to become familiar with the specific aspects of ZEBs. Knowledge of Emergency Response policies and guidelines to be able to assist First Responders is an especially critical component of the County's ZEB transition planning efforts.

Tow Truck Service Providers

Tow truck providers will need to be trained with the new buses and proper procedures for towing ZEBs.

Body Repairers

Body repairers will need to be proficient with the safety-related features and other components of ZEBs.

Operator and Maintenance Instructors

For both bus operations instruction and maintenance, instructors will need to understand all aspects of ZEBs to train others.

Service Attendants

Service attendants will become familiarized with proper charging and servicing protocols and procedures that are ZEB-specific.

Management Staff

All management staff (supervisors, directors, etc.) will be proficient with ZEB operations and safety procedures.

Safety Coordinators

It is a county priority to provide a safe and healthy environment, and to ensure all employees comply with the County's safety and health rules and procedures. To accomplish this, as the zero emissions technologies are implemented, the County will work with their own, and the Union's, Safety and Health Specialists to identify and develop a cadre of worksite coordinators comprised of front-line supervisors and shop stewards. Safety coordinators will be adequately trained and authorized to assist Safety and Health Specialists in promoting a safe work environment.

Apprenticeship Program

Montgomery County is also in the process of developing a formal apprenticeship program for various transit positions to build a future workforce while also lifting up the community. The goal of the program is to offer on-the-job training and work experience to attract, develop and retain a successful workforce through structured training and mentoring from veteran employees. The program will:

- Recruit and develop a diverse and highly skilled workforce
- Improve productivity
- Reduce turnover
- Create flexible training options that ensure workers develop the right skills
- · Retain workers
- Foster a diverse and inclusive culture

10 Funding Sources



Address the availability of current and future resources

County Capital Improvements Program

The Montgomery County FY23-FY28 Capital Improvements Program (CIP) includes \$155 million to support the initial transition to a zero emission Ride On fleet. The CIP recommends over \$40 million across FY23-FY24 for the procurement of electric buses. These added bus purchases will allow the Brookville Smart Energy Bus Depot microgrid to be utilized to a full capacity.

State Funding

The Maryland Energy Administration offers multiple funding sources in support of ZEB.

• <u>The Clean Fuels Incentive Program</u> provides financial assistance for the purchase of new converted alternative fueled fleet vehicles in the state of Maryland. This is a competitive statewide grant program. Eligible applicants for the program include municipal authorities and local government entities. Both electric and hydrogen buses are covered under the program.

• The Electric Vehicle Supply Equipment (EVSE) Rebate Program provides funding assistance for costs incurred acquiring and/or installing qualified EV supply equipment. Eligible applicants for the rebate program include units of state or local government. Costs for the rebate include site design, charger equipment, installation, labor, site preparation, upgrade for utility connections, signage and equipment necessary to implement and operate the charging station.

Federal Funding

Multiple funding sources are offered by federal agencies to aid in the transition to ZEB. The funding agencies include FTA, USDOT, EPA and FHWA as outlined in the **Table 10-1** below.

Table 10-1: Potential Federal Funding Sources

Funding Program	Source/Agency
Metropolitan & Statewide Planning and Non-Metropolitan Transportation Planning program	FTA
Urbanized Area Formula Grants	FTA
The State of Good Repair Grants	FTA
Flexible Funding Program – Surface Transportation Block Grant Program	FTA
Low and No Emissions Program	FTA
Bus and Bus Facilities Competitive Program	FTA
Capital Investment Grants – New/Small Starts program	FTA
Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Grant	USDOT
Charging and Fueling Infrastructure Competitive Grants	USDOT
National Electric Vehicle Formula Program	USDOT
Environmental Justice Collaborative Program-Solving Cooperative Agreement Program	EPA
Diesel Emissions Reduction Act (DERA) National Grants	EPA
Congestion Mitigation and Air Quality Improvement Program	FHWA

Alternative Sources

Public-private partnership business models are available to finance and/or fund the ZEB investment. As mentioned before, MCDGS entered into an agreement with AlphaStruxure to deploy the Brookville Smart Energy Bus Depot selecting the Energy-as-a-Service (EaaS) business model. EaaS consists of turn-key project management services for the construction and installation of infrastructure and the deployment of smart charging. For the Brookville Smart Energy Bus Depot, AlphaStruxure will design, build, finance, own and operate the project. This allows the microgrid and charging infrastructure to be delivered at no

upfront cost to the County through an EaaS contract. The contract provides a long-term agreement between AlphaStruxure and the County ensuring predictable operating expenses and guaranteed performance for sustainability, resilience, and reliability. As implemented for the Brookville Smart Energy Bus Depot, EaaS offers a financing mechanism for additional facility modifications in the future.

11 Start-up and Scale-up Challenges

MCDOT has identified several challenges and opportunities associated with implementing ZEB technology in its Bus Fleet Management Plan 2020-2030, including:

Daily Service Requirements Vs. Range Limitations

Ride On services span 21 hours per weekday with 79 routes operated by the County. Weekday bus mileage can range from 63 miles to up to 350 miles per bus. This presents a constraint to BEB meeting service requirements, as they cannot travel as long without recharging. The current diesel bus fleet can range up to 450 miles before needing to be refilled. According to a study at the Altoona Bus Testing Facility, battery electric buses had a maximum range of 21.5 miles to 145 miles and hydrogen buses had a 200-mile daily range in an arterial bus profile similar to Ride On routes. BEB range is also substantially affected by weather, passenger load, terrain, and battery age. **Figure 11-1** shows daily bus range broken down by depot (as of Fall 2020) highlighting the three levels of charging that would be needed for BEBs.

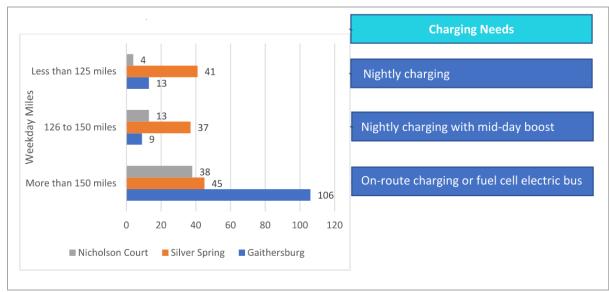


Figure 11-1: Daily Estimated Battery Electric Bus Range By Depot

Source: MCDOT Ride On Bus Fleet Management Plan 2020-2030

Bus Weight Restrictions

Extending electric bus range is essential to ensuring an efficient transition to BEBs without compromising service. However, extending electric bus range requires adding more batteries, storage capacity and weight. This can create a challenge as larger capacity batteries are heavy and can cause the buses to exceed the legal axle weight limits. The current single axle weight limit in the state of Maryland is 24,000

pounds. Although several bus manufacturers offer extra high-capacity battery arrangements (600+ kWh of onboard storage), with current battery technology, axle weight regulations often limit the total number of passengers the vehicle can be operated with onboard to well below the physical carrying capacity (number of seats and floor space for standees).

Annual Mileage Constraints

On average, the County's CNG buses travel 53,000 miles and diesel buses travel 40,000 miles annually per bus. According to National Transit Database (NTD) data of electric buses, Ride On BEBs could expect 20,000-30,000 miles annually per bus. The annual anticipated mileage per BEB is expected to significantly increase in coming years, and careful management of zero emission bus procurements should be able to significantly reduce, if not eliminate a requirement to increase the size of the bus fleets. Buses operating at a higher annual mileage may need to be replaced more frequently than anticipated. A combination between BEBs and FCBs could address this constraint.

Charging Infrastructure Constraints and Costs

The electric bus infrastructure will be heavily influenced by duty cycle and weather. Charging capacity should allow for 3 kWh per mile for 150 daily miles or 450 daily kWh per bus. Depending on charger size and efficiency, it could take between 4 hours-10 hours to recharge a bus, though this may change with future technology advances. The implementation of electric bus charging infrastructure also requires both utility infrastructure and on-site electrical at the facilities, which is costly. The County is continually monitoring the performance of their current BEB fleet and is engaged with various industry resources, to better understand and predict future charging requirements throughout the ZEB transition, and as changes in service plan and facility location(s) are introduced. These constraints are not a concern for FCBs; therefore, utilization of fuel cell could offer a solution.

Electric Bus Specialized Maintenance Needs

While many of the components of electric bus maintenance are the same as traditional buses, there are added features that will require specialized technicians. Batteries, electric motors, inverters, control systems and charging equipment will require maintenance practices that differ from supporting conventional buses. In addition, available ZEB technology and equipment are constantly evolving, so some of the future maintenance needs and activities are still unknown.

Increased Electricity Costs and Usage

Electricity costs will rise when used as a power source for BEB since there is increased usage. The April 2020 Pepco bill for Brookville Smart Energy Bus Depot was just under \$6,000, with estimates of almost \$225,000 annually for 14 BEBs. These costs will continue to rise as more buses are added to the fleet and other facilities incorporate charging infrastructure². However, the increased electricity cost is off-set by a decrease in diesel fuel use.

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² Although electricity costs may arise, as there is increased pressure on the current electrical grid for all different transitions to ZEVs, MCDOT's current electrical bill for the four BEBs runs under \$3,000.

Additional Challenges

In addition to the challenges explained in the Montgomery County Bus Fleet Management Plan 2020-2030, there may be other potential challenges associated with purchasing and transitioning to ZEB technology. These include:

- High vehicle capital costs
- Procurement phasing/timing
- Multi technology operations during transition
- Utility company needed upgrades
- Technological adaptation
- IT infrastructure cost/challenge
- Funding challenges
- Training and outreach activities
- New public-private partnership opportunities
- Policy decisions and political support
- Industry capacity for increased ZEB production

12 Next Steps

MCDOT is slated to convert their entire fleet to ZEB by 2035 and, is currently determining the path forward to meeting its transition goals. Identifying infrastructure and facility needs, including in-route charging, is an action item moving forward. As well, as analyzing locations that are best suited along Ride On bus routes to be modified to support on route charging. With four BEBs in operation, ten currently ordered and the planned acquisition of 86more, MCDOT will continue to make additions to the fleet until it is fully transitioned.

This analysis is a living document. MCDOT will update the plan as the agency procures ZEB technology, learns from the pilot program and current roll out strategy, and designs and builds the needed infrastructure.

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Attachment C

Budget Documents

Hydrogen Fuel Cell Buses and Fueling Site Montgomery County, Maryland

Low or No Emissions Grant Program 2022



CategoryTransportationDate Last Modified01/11/22SubCategoryMass Transit (MCG)Administering AgencyTransportationPlanning AreaCountywideStatusOngoing

EXPENDITURE SCHEDULE (\$000s)

Cost Elements	Total	Thru FY21	Est FY22	Total 6 Years	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	Beyond 6 Years
Other	376,209	181,090	39,734	155,385	17,220	23,015	19,845	21,300	34,610	39,395	-
TOTAL EXPENDITURES	376,209	181,090	39,734	155,385	17,220	23,015	19,845	21,300	34,610	39,395	-

FUNDING SCHEDULE (\$000s)

Funding Source	Total	Thru FY21	Est FY22	Total 6 Years	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	Beyond 6 Years
Contributions	820	430	390	-	-	-	-	-	-	-	-
Current Revenue: Mass Transit	165,767	41,329	26,878	97,560	15,220	17,820	15,715	16,105	16,370	16,330	-
Fed Stimulus (State Allocation)	6,550	6,550	-	-	-	-	-	-	-	-	-
Federal Aid	55,080	37,874	7,606	9,600	1,600	1,600	1,600	1,600	1,600	1,600	-
G.O. Bonds	956	956	-	-	-	-	-	-	-	-	-
Impact Tax	2,350	2,350	-	-	-	-	-	-	-	-	-
Short-Term Financing	127,146	81,261	60	45,825	-	3,195	2,130	3,195	16,240	21,065	-
State Aid	17,540	10,340	4,800	2,400	400	400	400	400	400	400	-
TOTAL FUNDING SOURCES	376,209	181,090	39,734	155,385	17,220	23,015	19,845	21,300	34,610	39,395	-

APPROPRIATION AND EXPENDITURE DATA (\$000s)

Appropriation FY 23 Request	17,220	Year First Appropriation	FY09
Appropriation FY 24 Request	23,015	Last FY's Cost Estimate	289,976
Cumulative Appropriation	220,824		
Expenditure / Encumbrances	190,465		
Unencumbered Balance	30,359		

PROJECT DESCRIPTION

This project provides for the purchase of replacement and additional buses in the Ride On fleet in accordance with the Division of Transit Services' bus replacement plan and the Federal Transportation Administration's service guidelines.

ESTIMATED SCHEDULE

FY23: 13 large zero-emission; FY24: 16 large zero-emission and 7 microtransit; FY25: 18 large zero-emission; FY26: 20 large zero-emission; FY27: 7 large zero-emission and 28 small zero-emission; FY28: 8 large zero-emission, 30 small zero-emission, and 7

Ride On Bus Fleet 16-1

microtransit.

COST CHANGE

The cost increase is due to the addition of FY27-FY28 and to the purchase of zero-emission buses. Costs in all years reflect the purchase of zero-emission vehicles with the goal of transitioning to a 100% zero-emission fleet.

PROJECT JUSTIFICATION

The full-size transit buses have an expected useful life of twelve years. Smaller buses have an expected useful life of ten years. Microtransit buses have an expected life of four years.

OTHER

MCDOT will continue to apply for grants to cover the cost of additional zero emission buses and associated infrastructure. By deploying zero emission buses in lieu of clean diesel and CNG buses, Ride On will reduce harmful emissions of greenhouse gases associated with its fleet.

Ride On through its commitment to have all future purchases zero-emission buses, is exceeding standards compared to most other transit agencies. For example, California, considered a leader in zero bus emissions implementation, recently enacted a regulation that will require all large transit agencies to include at least 25 percent zero emission buses in their new bus purchases beginning in 2023. Planned bus procurements assume that complimentary and required maintenance and charging/fueling infrastructure projects will be in place as needed. Planning for the development and further implementation of these projects will be funded primarily through this CIP. Due to infrastructure constraints, 61 small diesel buses will be refurbished to extend their service lives and delay replacement until zero-emission charging/fueling infrastructure plans are developed for all depots.

DISCLOSURES

Expenditures will continue indefinitely. The County Executive asserts that this project conforms to the requirement of relevant local plans, as required by the Maryland Economic Growth, Resource Protection and Planning Act.

COORDINATION

Department of General Services, Maryland Transit Administration

Ride On Bus Fleet 16-2

Attachment D

Statements of Qualifications & Commitments

Hydrogen Fuel Cell Buses and Fueling Site Montgomery County, Maryland

Low or No Emissions Grant Program 2022



May 11, 2022

Mr. Kevin M. Sanders
Chief, Management Services
Montgomery County Department of Transportation
Division of Transit Services
101 Monroe St
Rockville, MD 20850

Dear Mr. Sanders:

The Center for Transportation and the Environment (CTE) is pleased to join Montgomery County and Trillium in responding to the Federal Transit Administration's (FTA) FY2022 Low or No Emission (Low-No) Vehicle Program and Grants for Buses and Bus Facilities Competitive Program. CTE commends your efforts to pursue Low-No funding to support deployment of 13 fuel cell electric buses and supporting infrastructure.

CTE is committed to supporting Montgomery County as an expert project consultant for zero-emission bus deployments. CTE has managed zero-emission bus demonstrations and deployments under multiple FTA programs including Low-No, TIGGER, Livability, Clean Fuels, and the National Fuel Cell Bus Program. Through these and other programs, CTE has assisted more than 75 transit agencies that have either deployed, or will soon deploy, more than 430 zero-emission buses.

In our role as Project Consultant, CTE will leverage our extensive experience supporting transit agencies deploying zero-emission buses. CTE will assist in bus and route analysis, fueling profiles, and modeling to inform operational decisions and refine bus and fueling equipment requirements. CTE will provide support for the procurement of buses and the technical evaluation of proposals to ensure Montgomery County understands the performance capabilities of proposed buses. CTE will provide technical support for the installation of the hydrogen production/fueling station. Following delivery of the buses, CTE will validate the performance of the bus against specifications and/or modeling results. Once the buses are placed in revenue service, CTE will collect operational data to ensure the buses are performing as expected. CTE will also assess energy savings, cost savings, and emissions reductions resulting from the deployment.

We look forward to the opportunity to work with Montgomery County and Trillium on this exciting project to support Montgomery County's first deployment of fuel cell electric buses and hydrogen fueling infrastructure.

Sincerely,

Daniel J. Raudebaugh Executive Director 730 Peachtree Street, Suite 450 Atlanta, GA 30308



FY2022 Low-No Qualifications

Center for Transportation and the Environment

The Center for Transportation and the Environment (CTE) is a 501(c)(3) nonprofit with the mission to improve the health of our climate and communities by bringing people together to develop and commercialize clean, efficient, and sustainable transportation technologies. CTE collaborates with federal, state, and local governments; fleets; and vehicle technology manufacturers to advance clean, sustainable, innovative transportation and energy technologies. Since its founding in 1993, CTE has managed a portfolio of more than \$800 million in research, development, demonstration, planning, and deployment projects funded by federal and state organizations including the U.S. Departments of Transportation, Energy, Defense, and Interior, as well as the California Air Resources Board and California Energy Commission.

Experience

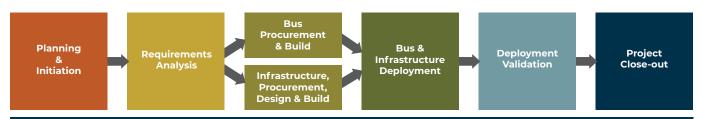
CTE is the national leader in providing technical assistance for zero-emission bus (ZEB) deployments, guiding transit agencies through battery-electric and fuel cell electric bus deployment projects while minimizing project risks. The unique operating characteristics and fueling requirements of these deployments may present challenges for transit agencies who are accustomed to operating conventionally fueled vehicles. Regardless of an agency's familiarity with zero-emission buses, CTE can provide the expertise necessary to help agencies mitigate risks associated with these deployments. CTE understands both the technical and administrative challenges associated with the procurement, deployment, and operation of zero-emission vehicles.

CTE has managed a range of zero-emission bus projects over the last decade, from new bus development and demonstration projects to full fleet deployment projects. This portfolio includes projects made possible through the Federal Transit Administration's (FTA) Low or No Emission Vehicle Program, TIGGER Program, Clean Fuels Program, and the National Fuel Cell Bus Program. Through these and other programs, CTE has provided technical and management support to more than 75 transit agencies that have either deployed or will soon deploy more than 400 zero-emission buses. CTE has also managed or participated in more than 35 transition planning projects—in locations across the country—to help agencies move towards fully zero-emission fleets.

Approach

Based on this experience, CTE developed a Zero-Emission Smart Deployment Methodology to assist transit agencies in their zero-emission bus deployments. The cornerstone of CTE's approach is to apply our modeling and analysis tools to match transit service requirements with the right ZEB technologies and operational strategies. CTE's approach equips agency staff with a robust understanding of the ZEB market and technology options as well as the impact that these options have on operational strategies and related costs.

Smart Deployment Methodology



Project Management, Administration, Reporting, and Control

Services

CTE has created a suite of services to support agencies applying for Low-No funding based on our Zero-Emission Smart Deployment Methodology, which are specifically designed to help agencies understand ZEB technologies and how to successfully deploy them. Based on our success with previous Low-No projects, CTE offers several project and technical consulting service packages designed to fit a variety of client requirements. Each service package consists of a combination of tasks from the full list of services in CTE's Smart Deployment Methodology:

- Project Planning
- Route, Bus, Charge, and Rate Modeling
- Bus & Fueling Advisory
- Procurement Support & Technical Evaluation
- Performance Validation
- ▶ Benefits Assessment & Deployment Validation
- Project Management & Technical Advisory

Industry Involvement

CTE is an active participant in industry-led initiatives, representing the organization's diverse relationships with industry stakeholders:

- American Public Transportation Association's (APTA) Zero Emission Bus Standard Bus Procurement Guidelines Development Committee
- ► CTE staff authored two reports: *Electric Battery Buses State of Practice* and *Guidebook for Deploying Zero-Emission Transit Buses* for the Transportation Research Board's Transit Cooperative Research Program
- ► CTE staff authored two white papers and a guidebook: Building Successful Partnerships between Rural Transit Systems Deploying Zero-Emission Vehicles and their Electric Utilities, Hydrogen as a Transportation Fuel in Rural Communities, and Guide to Green Energy Adoption for Transit Agencies for the National Center for Applied Transit Technology (N-CATT)

CTE is also leading the ZEB industry with a number of outreach initiatives designed to educate stakeholders, support collaboration, and advance the state of the technology to best serve the needs of transit agencies across the country:

- Zero Emission Bus Resource Alliance (ZEBRA) CTE provides technical assistance and industry consultation
- ▶ International Zero Emission Bus Conference CTE hosts and organizes the event each year, gathering industry leaders from around the world
- ▶ FTA's Transit Vehicle Innovation Deployment Centers (TVIDC) —CTE leads an expert transit industry advisory panel to address bus testing and research topics related to ZEB development and adoption.

The Center for Transportation and the Environment is a 501(c)(3) nonprofit organization with a mission to improve the health of our climate and communities by bringing people together to develop and commercialize clean, efficient, and sustainable transportation technologies.



Ms. Amy Volz Low-No/Bus Grant Program Manager Federal Transit Administration 1200 New Jersey Ave, SE Washington, DC 20590

Subject: Trillium's support of Montgomery County's application to FTA's FY 2022 Low or No Emission Grant Program

Dear Ms. Volz:

Trillium is pleased to join a team led by Montgomery County in responding to the Federal Transit Administration's (FTA) FY 2022 Low or No Emission Grant Program. The funding will assist the transit in building an onsite hydrogen production facility to fuel Montgomery County's zero emission fuel cell buses so they can continue to provide low-cost transportation for their communities while eliminating emissions spread by their vehicles. In fact, the only emission created by the fueling system will be based on the source of power for the electrolysis process. For this case, Montgomery County will be utilizing their own production of power via solar arrays installed on their property.

Founded in 1994, Trillium has specific experience in deployment of hydrogen and heavy-duty fueling infrastructure. Trillium has already deployed hydrogen fueling infrastructure for transit fleets at two locations, Orange County Transportation Authority (OCTA) and Champaign Urbana Mass Transit District (CUMTD) and kicked off our 3rd hydrogen fueling station for North County Transit District (NCTD) in Oceanside, CA. Trillium also has CNG/RNG fueling at over 200 locations nationwide serving transit, waste, and over-the-road fleets. Our extensive knowledge and experience include efficient station design and engineering, utility coordination, Authorities Having Jurisdiction (AHJ) coordination, and low-carbon fuel production/procurement. As we move into a new era of clean fueling solutions, we are confident that our understanding of the hydrogen industry and transit operations ideally positions us as a perfect project partner.

Montgomery County's proposed project will be identical to CUMTD's as both will produce hydrogen via an onsite 1-megawatt electrolyzer and source power from their own solar arrays. Trillium and Montgomery County also have a long-standing relationship in alternative fueling as Trillium designed, built, and currently operates and maintains Montgomery County's CNG station.

Thank you in advance for your consideration of Montgomery County's application. We appreciate the opportunity to foster another partnership in the zero-emission market and to assist another transit in their efforts to a zero-emission transition.

Sincerely,

Ryan Erickson

Vice President of Trillium

Trillium USA Company, LLC



TRILLIUM PROFILE

1.1 Profile of Firm

Trillium USA Company, LLC dba Trillium, is a limited liability company existing under the laws of the state of Delaware, headquartered in Houston. Trillium owns and/or operates nearly 200 Compressed Natural Gas (CNG) stations across the country, dispensing over 80 million gasoline gallon equivalents (GGE) annually through the network. Trillium provides complete operational services for alternative fuel stations to a variety of nationwide customers including municipalities, delivery fleets, refuse trucks, transit agencies, airport shuttles and taxis. Trillium has performed these services for CNG, hydrogen and electric vehicle charging fueling stations.

Trillium was founded in 1994 and in 2016 later joined the Love's Family of Companies. Trillium has 125 employees with a network of over 100 mechanics stationed across the country ready to deploy to our customers if the need arises. We have local mechanics in the Maryland area, who currently maintain Montgomery County's CNG station, and we plan to use the same mechanics for your proposed hydrogen fueling station.

Founded in 1964 by Tom and Judy Love in Oklahoma City, Love's provides professional truck drivers and motorists with 24-hour access to clean and safe places to purchase gasoline, diesel fuel, CNG, battery electric vehicle charging, travel items, electronics, snacks, restaurant offerings and more. Love's Truck Care offers heavy-duty tire care, light mechanical services, and roadside assistance. Love's Hospitality provides a growing network of hotels and storage rental locations and Love's Financial offers freight bill factoring and back-office support to professional drivers.

The Love's Family of Companies has more than 35,000 combined employees supporting Love's travel stops, Speedco locations, Love's corporate offices located in Oklahoma City, corporate offices with Musket Corporation and Trillium located in Houston along with Gemini Motor Transport driver. Our employees are dedicated to helping Love's customers and the surrounding communities.

The Love's Family of Companies are:

more than 500 Love's locations.

➤ Gemini Motor Transport is a nationwide for-hire fuel, crude, and specialty products motor carrier. In 2001, Gemini became the primary carrier for Love's Travel Stops & Country Stores and has grown to operate more than 1,000 trucks and employs approximately 1,200 professional drivers. Headquartered in Oklahoma City, Gemini's drivers drive more than 100 million miles annually across the country. Gemini has been one of the industry's safest transportation companies over the years and was recently awarded the National Tank Truck Carriers (NTTC) Grand Champion Award in its 2020 Safety Contest. This is the sixth year Gemini has won the award for safely operating a fleet that delivers millions of gallons of daily fuel to

Musket Corporation is a commodity supply, trading, and logistics company with offices in Houston, Oklahoma City and Phoenix. Musket supplies Love's with gasoline and diesel and manages the company-wide biodiesel program. Musket is one of the largest blenders and sellers of D4 RINs in the country. Whether shipping via pipeline, rail or by truck, Musket provides the logistics, marketing, operational and trading expertise to deliver reliable and efficient customer solutions.



Speedco joined the Love's Family of Companies in 2017 and provides quick oil change and inspection services. Speedco provides comprehensive lube, tire, and light mechanical services for professional drivers. Together, Love's and Speedco make up the largest oil change and preventative maintenance nationwide network on the road today with more than 390 locations. For over 25 years, Speedco has been a leader in lube services

and high-speed PM services at highway locations across the U.S.



1.2 General Description of Firm's Financial Condition

The Love's Family of Companies, that includes Trillium, ranks among the top 16 of America's largest privately held firms in the country by Forbes. Love's Travel Stops & Country Stores (Love's) has more than 570 locations across the Nation. This financial backing, and the fact that Trillium does not have any conditions that would impede our ability to complete the project, positions Trillium to be a continued longterm partner for both the hydrogen and CNG fueling station projects.



TRILLIUM CAPABILITIES & EXPERIENCE

2.1 Capabilities of Firm

Trillium has a proven track record of timely completion of station design and build projects, with an added advantage of nearly three decades of experience installing and operating alternative fueling stations, similar to the system proposed for Montgomery County.

Trillium's client portfolio includes hundreds of robust stations designed for transit agencies, municipal and private waste management companies, and heavy-duty trucking fleets.

Our project team will be led by General Manager of Design Build Services, Carson Hoyt. He oversees all Trillium's design build services that will play a key role in delivering fueling stations on time and under budget. Mr. Hoyt joined the Love's Family of Companies in 2002; he and the Trillium project team have over 30 combined years of compressed natural gas client support experience, which we are leveraging for the hydrogen fueling industry.



Today, Trillium provides compressed natural gas fueling station operational services to over 30 different transit partners to service over 50 compressed natural gas stations. Please note the following Trillium transit locations we serve today:

Station	Location
Arlington Regional Transit	Arlington, VA
Beaver County Transit Authority	Rochester, PA
Cambria County Transit Authority – Maple Avenue	Johnstown, PA
Cambria County Transit Authority – Center Street	Ebensburg, PA
Centre Area Transportation Authority	State College, PA
City of Thousand Oaks	Thousand Oaks, CA
Greater Cleveland Regional Transit Authority	East Cleveland, OH
Greater Richmond Transit Company	Richmond, VA
Hillsborough Area Regional Transit Authority	Tampa, FL
Massachusetts Bay Transportation Authority – Arbor Way	Boston, MA
Massachusetts Bay Transportation Authority – Cabot Yard	Boston, MA
Metropolitan Transportation Authority – College Point	Flushing, NY
Metropolitan Transportation Authority – Grand Avenue	Maspeth, NY
Metropolitan Transportation Authority – Spring Creek	Queens, NY
Mid Mon Valley Transit Authority	Donora, PA



Station	Location				
Montgomery County Ride-On	Rockville, MD				
New York City Transit – Grand Avenue	Maspeth, NY				
New York City Transit – Jackie Gleason	Brooklyn, NY				
New York City Transit – West Farms	Bronx, NY				
New York City Transit – Zerega	Bronx, NY				
Niagara Frontier Transportation Authority	Buffalo, NY				
North County Transit District – East	Escondido, CA				
North County Transit District – West	Oceanside, CA				
Orange County Transportation Authority	Anaheim, CA				
Orange County Transportation Authority	Garden Grove, CA				
Orange County Transportation Authority	Santa Ana, CA				
Pace Bus	Markham, IL				
PennDOT AMTRAN	Altoona, PA				
PennDOT BCTA	Beaver, PA				
PennDot BTA	Butler, PA				
PennDOT CAT	Harrisburg, PA				
PennDOT CATA	State College, PA				
PennDOT CRATA	Meadville, PA				
PennDOT COLT/LT	Lebanon, PA				
PennDot EMTA	Erie, PA				
PennDOT INDIGO	Indiana, PA				
PennDOT LANTA	Allentown, PA				
PennDOT MMVTA	Donora, PA				
PennDOT NCATA	New Castle, PA				
PennDOT MCTA	Swiftwater, PA				
PennDOT WCTA	Greensburg, PA				
PennDOT YATA	Gettysburg, PA				
Riverside Transit Agency – Third Street	Riverside, CA				
Riverside Transit Agency – Scaramella Circle	Hemet, CA				
Roaring Fork Transportation Authority	Glenwood Springs, CO				

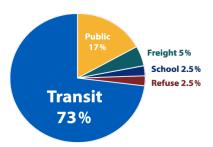


Station	Location
Rock Region Metro	North Little Rock, AR
San Diego MTS – South Bay	Chula Vista, CA
San Diego MTS – East Division	El Cajon, CA
San Diego MTS – Imperial Avenue	San Diego, CA
San Diego MTS – Kearney Mesa	Kearney Mesa, CA
Transpo – South Bend	Sound Bend, IN
Trinity Metro	Fort Worth, TX
Utah Transit Authority	Salt Lake City, UT
VIA Metropolitan Transit	San Antonio, TX
Visalia Transit	Visalia, CA
Westmoreland County Transit Authority	Greensburg, PA
Yolo County Transit	Woodland, CA
York Adams Transit Authority	York, PA

2.2 Trillium's Alternative Fuel Station Transit Experience

Montgomery County will benefit from working with an alternative fueling partner that has almost 25 years of experience in the transit agency industry. We are excited to help Montgomery County further achieve their zero emission goals.

Trillium is one of few companies that specializes in serving the particular needs of the transit industry, providing more than 40 million gallons of alternative fuel to transit agency buses each year. We have a clear understanding of transit agency alternative fueling needs, contracting and regulatory requirement processes. Our service and support systems were created specifically to support transit fueling. Many transit agencies that rely on cost-effective, dependable, and safe alternative fueling stations have selected



Trillium's years of focus on the transit industry makes us experts. We provide alternative fueling for many of the top transits in the US.

Trillium to design and build, upgrade, and/or take over operations and maintenance from competing firms.



2.3 Project References

Trillium has one of the most extensive project portfolios in the industry. Please note just a few of our projects with agencies similar to Montgomery County:

Champaign Urbana Mass Transit District (CUMTD) - Champaign-Urbana, IL

In 2019 Trillium was awarded a contract to construct a solar-powered hydrogen production fueling station with the ability to power approximately 20, 60-foot hydrogen fuel cell buses for Champaign Urbana Mass Transit District (MTD), serving the cities of Champaign, Urbana, Savoy, and the University of Illinois at Urbana-Champaign.

The station will produce hydrogen onsite via a 1MW Nel electrolyzer. Less than 6 months into the project, the Coronavirus pandemic began, and Trillium did not miss a beat. Trillium continued to hold regular meetings with CUMTD to discuss and align on design, equipment procurement and utility planning. Trillium led a Hydrogen Safety Panel design review with participation from CUMTD and their consultant CTE.



Additionally, Trillium recognized that hydrogen was new for the community so, we got local AHJ, first responders and utilities involved very early on and have kept them in the loop with the progress. Trillium has complied with all permitting and code requirements to date and had project managers on-site multiple days a week through construction and commissioning to ensure smooth execution of the project. The project reached substantial completion as of November 11, 2021.

Trillium learned quite a bit from this CUMTD's hydrogen project and Montgomery County will greatly benefit from these learnings as the lessons learned will be directly applied to the Montgomery County electrolyzer station.

Orange County Transportation Authority (OCTA) - Santa Ana, CA

Trillium designed and built and currently operates and maintains one of the largest hydrogen fueling stations in the country for the Orange County Transportation Authority (OCTA). The OCTA station is a liquid hydrogen



fueling station for OCTA's fuel cell bus fleet. Trillium currently manages hydrogen deliveries to OCTA's fueling station. With minor upgrades, the station can fuel up to 50 hydrogen fuel cell buses. Prior to the hydrogen fueling station project, Trillium designed and installed three high-capacity CNG fueling facilities between 2006 and 2008 for OCTA. Those stations allowed OCTA to add over 500 CNG buses that consume an average of 2.6 million gallons of CNG per year. Each of the three sites fills a bus in less than four minutes for maximum fueling efficiency.



Trillium currently provides operation and maintenance services for all three transit CNG fueling stations located in Anaheim, Garden Grove and Santa Ana, CA. OCTA's hydrogen fueling station is the fourth fueling station that Trillium operates and maintains for OCTA.

VIA Metropolitan Transit (VIA) - San Antonio, TX



Trillium designed, constructed, and now operates and maintains the single, largest CNG refueling station in the country for VIA Metropolitan Transit in San Antonio, Texas. Construction on VIA's CNG fueling station began in the summer of 2016 and was completed in early 2018. With the largest size and capacity in North America, the station has seven 700-horsepower compressors with a total capacity of approximately 10,000 standard cubic feet per minute, or 82 gasoline gallon equivalent per minute. The station contains eight storage vessels with a total of approximately

88,000 standard cubic feet at 4,500 pounds per square inch. The station has 10 fast fill transit dispensers, capable of fueling a 120-gallon tank in under five minutes.

The Trillium project team met the station specifications and continues to exceed VIA's expectations.

Attachment E

Fleet Management Plan

Hydrogen Fuel Cell Buses and Fueling Site Montgomery County, Maryland

Low or No Emissions Grant Program 2022

RIDE ON BUS FLEET MANAGEMENT PLAN 2020 – 2030

June 2021

Version 1.1

Montgomery County Department of Transportation Division of Transit Services Rockville, Maryland





 CO_2 and resulted in a net savings of 19,354 metric tons of CO_2 . As the County increases Ride On services and uses cleaner buses such as ZEBs, Ride On's positive air quality effects will continue to increase.

• Easier Commutes

- Traffic congestion in the Washington Metropolitan Region is among the worst in the nation, and it impacts the lives of many County residents daily. In FY 2020 Ride On provided an estimated 80,743 weekday passenger trips. In addition to direct service to key destinations, Ride On reduces traffic congestion by connecting residents to the Metrorail and Metrobus services. On an average weekday, more than 16,000 Ride On's riders use local bus routes for connections to Metrorail and Metrobus services.
- Through the County's Flash BRT initiative, continued progress is being made to retain existing riders and attract new commuters. The Flash on US29 began operations in 2020 and the County's Capital Improvements Program includes funding for Veirs Mill and MD355 BRT engineering and planning. Planning is also underway for the New Hampshire Avenue and North Bethesda Transitway BRT corridors.

A Growing Economy

 Improved access to jobs and education for lower income communities is a key ingredient for expanding economic prosperity for all county residents. The 2019 on-board survey indicated that 47% of Ride On trips were made by residents with household incomes less than \$30,000 and 44% of all trips were destined for work and school.

• Effective, Sustainable Government

 When compared to local market peer agencies, Ride On provided the lowest 2018 cost per revenue hour at \$113. Comparable agency 2018 costs per revenue hour in 2018 include Metrobus \$180, MTA \$163, Fairfax Connector \$115 and Prince George's County The Bus \$118.

8.1.1 Net Zero Greenhouse Gas Emissions

As climate change dramatically impacts our world, Montgomery County has adopted goals to reduce the County's GHG emissions by 80% by 2027 and 100% by 2035.

Ride On directly affects GHG emission by removing single passenger automobiles from local streets and highways. The County's transit service already operates as a net zero GHG emitter. It's most important contribution to the County's long term GHG emission goals is to retain existing transit customers and attract new riders. The County's continued investment in improving the transit customer's experience is the most effective way to reinforce Ride On's positive GHG emissions.

The County's historic investment in new buses (193 new and cleaner buses since 2015), bus stop improvements, transit maintenance facilities (such as Leed Gold certified EMTOC), transit centers (such as Montgomery Mall and Silver Spring) and WMATA bus and rail services continues to attract high transit market share.

Additional GHG emission reductions can be achieved through retaining existing customers and attracting new customers. Multiple strategies can support this initiative including expanded Ride On ExtRa and BRT services and fare policies targeting key groups such as Kids Ride Free and free fares for seniors.

ZEBs are also a popular GHG emission strategy. Replacing an existing bus with a ZEB with electricity from 100% clean energy sources is projected to save 683 metric tons of CO₂ over its twelve-year lifetime. However, adding service with one new clean diesel or CNG fueled peak bus at Ride On's FY2020 system average of 23 riders per hour would save 764 metric tons of CO₂ over twelve years.

In supporting the County's GHG emission goals, expanded transit services will be the most effective strategy followed by new LEED certified maintenance facilities and ZEBs.

8.2 Infrastructure Investments

Montgomery County elected officials and staff routinely prioritize investments to meet multiple public goals. A menu of potential infrastructure investments is identified in this section.

8.2.1 Fleet Replacement and Renewal

Ride On fleet replacement and renewal is important to:

- Reduce long term vehicle maintenance costs. As buses age maintenance costs increase. New buses with multi-year warranties can lower maintenance costs and reduce the need for hard to find mechanics.
- 2. Increase service reliability. New buses are typically much more reliable than older buses. Reducing breakdowns can improve the customer's experience by minimizing the dreadful event where a bus breaks down with a load of passengers.
- 3. Improved customer experience. Older buses, even when they are well maintained, are noisier than new buses. Through hundreds of thousands of miles on city streets, old buses rattle. Just as drivers enjoy a new car experience, transit customers know the difference in an old and new bus.
- 4. Reduce air quality emissions. Although bus engines are certified to the most recent air quality standards, as engines operate thousands of miles, they can be expected to emit more pollutants than new engines.

The FY22 bus replacement budget is shown in Table 34.

Table 34: FY22 Bus Replacement Budget

Budget Year	40'	30'	Microtransit	FY 22 Budget
FY 2021	10	5		\$11,795,000
FY 2022	20			\$18,300,000
FY 2023	15	30	7	\$30,820,000
FY 2024	12	21		\$21,333,000
FY 2025	12			\$6,444,000
FY 2026	18	1		\$10,555,000

8.2.2 Zero Emission Buses

ZEBs hold the potential of reducing Ride On GHG emissions and may provide limited operating cost savings. ZEB technology has some challenges including high capital cost, limited range, limited annual mileage, electric charging infrastructure, and hydrogen generation and storage which must be considered.

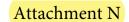
The County's revised FY22 - FY26 Ride On Bus Fleet Replacement budget totals \$88.1 million for replacement of buses including the acquisition of 55 ZEBs by 2024 for a fleet total of 59 ZEBs. Additional electric infrastructure will also be needed at the Brookville Depot to accommodate these electric buses.

Attachment F

Benefits Calculation Methodology

Hydrogen Fuel Cell Buses and Fueling Site Montgomery County, Maryland

Low or No Emissions Grant Program 2022





FY 2022 Low or No Emission Grant Program Project Proposal

Demonstration of Benefits Calculation Methodology

This document describes the methods used by the project team to determine the benefits of the proposed project, per Section E.1.b of the FY 2022 Low-No Program Notice of Funding Opportunity (NOFO).

Background

Applicants must demonstrate how the proposed project will support the statutory requirements of the Low-No Program (See 49 U.S.C. 5339(c)(5)(A)). In particular, FTA will consider the quality and extent to which applications demonstrate how the proposed project will: (1) Reduce Energy Consumption; (2) Reduce Harmful Emissions; and (3) Reduce Direct Carbon Emissions.

Approach

- Estimate the well-to-wheel energy required annually to fuel and operate:
 - the proposed zero-emission buses
 - · comparable modern fossil fuel buses
- Estimate the local harmful particulates emitted annually by fueling and operating:
 - the proposed zero-emission buses
 - comparable modern fossil fuel buses
 - · the buses that will be replaced
- Estimate the well-to-wheel greenhouse gases emitted annually by fueling and operating:
 - the proposed zero-emission buses
 - comparable modern fossil fuel buses
 - the buses that will be replaced

Tools

 Alternative Fuel Life-Cycle Environmental and Economic Transportation (AFLEET) Tool 2020, developed by Argonne National Laboratory

Inputs

- Agency location (used by AFLEET to estimate emissions generated by local electric utilities and the petroleum fuel pathway)
- Expected annual vehicle miles traveled (VMT) for proposed service
- Fuel type of proposed vehicles
- Expected fuel economy of proposed vehicles
- Expected fuel economy of comparable modern fossil fuel buses
- Fuel type of vehicles to be replaced
- Fuel economy of vehicles to be replaced

Assumptions

- ▶ Well-to-wheel energy estimates include the energy required to produce and deliver fuel (well-to-pump), as well as the energy used by the bus when in service (pump-to-wheel).
- ▶ Well-to-wheel GHG estimates include the GHGs produced during fuel production and delivery (well-to-pump), as well as the GHGs produced by the bus when in service (pump-to-wheel).
- ► The proposed vehicles and the comparable modern fossil fuel buses would be used to provide the same service; therefore, their expected VMT is equal.
- A comparable modern fossil fuel bus is a 2022 model year bus, with the same fuel type as the buses to be replaced.
- A comparable modern fossil fuel bus would achieve the same fuel economy as the agency's current fleet average. If not available, the average transit bus fuel economy as reported by the DOE Alternative Fuels Data Center (3.7 miles per diesel gallon equivalent) is used. [1]
- ▶ Based on CTE's experience in deployment projects and industry research, on average, battery electric vehicles consume the following:
 - For a 35-40' Low-Floor bus: 2.0 kWh per mile driven
 - For a 45' High-Floor bus: 2.5 kWh per mile driven
 - For a 60' Articulated Low-Floor bus: 2.8 kWh per mile driven
 - For a 25-32' Cutaway-style Shuttle bus: 1.0 kWh per mile driven
- ▶ Based on CTE's deployment experience, on average, a fuel cell electric bus achieves the following fuel efficiency:
 - For a 35-40' Low-Floor bus: 7.50 miles per kg H2
 - For 60' Articulated Low-Floor bus: 4.75 miles per kg H2
- ▶ The average American car driver uses 474 gasoline gallons per year [2]
- ▶ 1 BTU equals 1.0 x 10-6 gigajoules. [3]
- One gallon of gasoline contains 0.126908 gigajoules of energy.
- ▶ The following emissions are considered particulate emissions:
 - particulate matter under 10 micrometers (PM,₁₀);
 - particulate matter under 2.5 micrometers (PM_{2.5});
- ▶ The following emissions are considered greenhouse gases:
 - carbon dioxide (CO₂);
 - methane (CH₄); and
 - nitrous oxide (N₂O).
- ▶ The reported quantity of greenhouse gas emitted by each deployment scenario is calculated by AFLEET and is adjusted for global warming potential (GWP) per the IPCC Fifth Assessment Report (AR5). The resulting mass of GHGs is a composite of each component multiplied by its warming potential [4]
 - CO₂: 1
 - CH₄: 28
 - N₂O: 265
- Social cost estimates for GHGs (CO2, CH4 and N2O) are derived from President Biden's Executive Order 13990 using a 3% discount rate in 2020 dollars, interpolated for 2022, as follows: [5]
 - CO₂: \$53 per ton

- CH₄: \$1,580 per ton
- N₂O: \$19,200 per ton
- Social cost estimates for particulates comes from AFLEET which uses the AP2 2011 Marginal Damages model to estimate social costs relating to particulates. The cost estimate is based on a variety of factors and more details can be found on the model's site in the References section of this paper. [6][7]

Relevant Output

- Reduced Energy Consumption the degree to which the proposed technology reduces energy consumption as compared to more common vehicle propulsion technologies (i.e. a comparable modern fossil fuel bus)
- Reduced Harmful Emissions the rate of particulate emissions generated by the proposed vehicles, compared to the emissions from the vehicles that will be replaced or moved to the spare fleet as a result of the proposed project, as well as comparable modern fossil fuel buses
- Reduced Direct Carbon Emissions the rate of direct carbon emissions generated by the proposed vehicles, compared to the emissions from the vehicles that will be replaced or moved to the spare fleet as a result of the proposed project, as well as comparable modern fossil fuel buses

References

- 1. "Maps and Data Average Fuel Economy of Major Vehicle Categories." Alternative Fuels Data Center. U.S. Department of Energy, June 2015. Web. https://www.afdc.energy.gov/data/10310>.
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- 4. "Global Warming Potential Values." GHG Protocol. https://www.ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%20%28Feb%2016%202016%29 1.pdf>.
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- 6. "Alternative Fuel Life-Cycle Environmental and Economic Transportation (AFLEET) Tool." Argonne National Laboratory. https://greet.es.anl.gov/afleet_tool>
- 7. AP3 (AP2, APEEP Model). Muller, Nick. https://public.tepper.cmu.edu/nmuller/APModel.aspx>

Attachment G

Policy Documents

Hydrogen Fuel Cell Buses and Fueling Site Montgomery County, Maryland

Low or No Emissions Grant Program 2022

FY 2021-2024 TIP - Transportation Improvement Program

TIP ID3072Agency Project ID P500821Total Cost\$190,352,000Lead AgencyMontgomery CountyMunicipalityCountyMontgomeryProject TypeTransit - CapitalCompletion DateTCM

Project Type Transit - Capital Completion Date
Project Name Ride On Bus Fleet
Project Limits Not Location Specific

This project provides for the purchase of replacement buses in the Ride On fleet in accordance with the Division of Transit Services' bus replacement plan. The FY 15-20 plan calls for the following: FY 15: 26 full-size buses & 1 small diesel FY 16: 25 full-size buses FY 17: 15 full-size buses FY 18: 28

full-size buses FY 19: 9 full-size buses & 31 small diesel buses FY 20: 32 full-size buses

Phase	Fund Source	Prior	FY2021	FY2022	FY2023	FY2024	Future	Total
OTHER	SECT. 5307	\$12,800,000) -	-	-	-	-	\$12,800,000
OTHER	SECT. 5308	\$3,066,000) -	-	-	-	-	\$3,066,000
OTHER	LOCAL	\$91,747,000) -	-	-	-	-	\$91,747,000
OTHER	STATE	\$17,200,000) -	-	-	-	-	\$17,200,000
To	tal Other	\$124,813,000) -	-	-	-	-	\$124,813,000
Prog	Total rammed	\$124,813,000) -	-	-	-	-	\$124,813,000

FY 2021-2024 TIP - Transportation Improvement Program

TIP ID	6616	Agency Project ID	Total Cost	\$13,125,000
Lead Agency	Montgomery County	Municipality	County	Montgomery
Project Type	Transit - Capital	Completion Date	TCM	
Project Name	Electric Bus Grants		·	

Project Limits Not Location Specific For the procurement and installation of fourteen bus depot chargers, replacement of four 30' GILLIG diesel buses with four 35' Proterra' E2 battery electric buses, and ten 40' GILLIG diesel buses with ten 40' battery electric buses. The buses are Montgomery County's first zero-emission buses and

would be a component of green and sustainable initiatives underway in the county. Montgomery County, Maryland seeks to update its fleet with four Proterra 35' E2 battery electric buses to replace four GILLIG 30' diesel buses. Additionally, Montgomery County seeks to procure and install four depot chargers. The buses would be Montgomery County's first zero-emission buses and would be a component of green and sustainable initiatives

underway in the county.

Description

Phase	Fund Source	Prior	FY2021	FY2022	FY2023	FY2024	Future	Total
OTHER	SECT. 5339 (C)	\$10,500,000) -	-	-	-	-	\$10,500,000
OTHER	LOCAL	\$2,625,000) -	-	-	-	-	\$2,625,000
To	tal Other	\$13,125,000) -	-	-	-	-	\$13,125,000
Prog	Total rammed	\$13,125,000) -	-	-	-	-	\$13,125,000



MULTI-STATE MEDIUM- AND HEAVY-DUTY ZERO EMISSION VEHICLE

MEMORANDUM OF UNDERSTANDING

WHEREAS, the Signatory States and the District of Columbia¹ recognize the importance of state leadership and coordinated state action to ensure national progress in the effort to reduce greenhouse gas (GHG) emissions and stabilize global warming;

WHEREAS, the Signatory States have statutory obligations or otherwise seek to significantly reduce statewide GHG emissions by 2050, consistent with science-based targets;

WHEREAS, transportation is now the nation's largest source of GHG emissions, and, after lightduty vehicles, medium- and heavy-duty trucks are the next largest source of transportation sector GHG emissions;

WHEREAS, the Signatory States have a statutory obligation to provide their citizens with air quality that complies with national health-based air quality standards, which are required to be protective of health and the environment with an adequate margin of safety;

WHEREAS, fossil fuel related emissions from medium- and heavy-duty vehicles (MHDVs) are a major source of nitrogen oxides (NOx), particulate matter, and toxic air emissions, which are preventing many densely populated areas from achieving compliance with federal ambient air quality standards;

WHEREAS, emissions from MHDVs are a widely acknowledged, but unaddressed, environmental justice problem that directly and disproportionately impacts disadvantaged communities located near freight corridors, ports and distribution centers;

¹ Except where indicated otherwise, "Signatory States," as used in this document, includes the District of Columbia.

new medium- and heavy-duty vehicle sales in our jurisdictions zero emission vehicles by no later than 2030. Each Signatory State will report, within its available capabilities and on a schedule agreed to by the States, medium- and heavy-duty vehicle registration data needed to track progress toward meeting these targets. In 2025, the Signatory States agree to assess progress toward meeting the 2030 and 2050 targets and determine whether an adjustment to the 2030 interim sales target is appropriate.

5. PUBLIC FLEET PURCHASES AND FUELING STATIONS

To lead by example, each Signatory State will progress toward electrification of its government and quasi-governmental agency fleets and explore opportunities for coordinated/aggregated vehicle and infrastructure procurement.

6. INTER-AGENCY COORDINATION WITHIN STATES

The Signatory States will seek to support and facilitate the successful commercialization of zero emission MHDVs and maximize the use of renewable energy for ZEV charging and hydrogen fueling through inter-agency consultation and coordination with state public utility commissions, and environmental, energy, planning and transportation agencies, as appropriate.

7. PARTNERSHIPS WITH KEY STAKEHOLDERS

The Signatory States will explore opportunities to cooperate, coordinate and partner, as appropriate, with truck manufacturers, charging and fueling providers, community and environmental advocates, utilities, corporate fleet owners, financial institutions, Clean Cities Coordinators, and others to accelerate electrification of the MHDV sector.

8. NO LEGAL OBLIGATIONS, RIGHTS OR REMEDIES

This MOU is a voluntary initiative. It does not create any legally binding rights or obligations and creates no legally cognizable or enforceable rights or remedies, legal or equitable, in any forum whatsoever. In addition, the pledges in this MOU are not conditioned upon reciprocal actions by other Signatory States; each Signatory State retains full discretion over implementation of its pledges in light of the Signatory State's individual circumstances, laws, and policies; and each Signatory State is free to withdraw from the MOU.

9. ADDITIONAL PROVISIONS

- a. A Signatory State may terminate its participation in this MOU with a written statement to other Signatory States.
- b. Other states that commit to the conditions of this agreement may sign on to this MOU.
- c. This MOU may be amended in writing upon the collective agreement of the authorized representatives of the Signatory States.

Resolution No.: 18-974

Introduced: November 28, 2017
Adopted: December 5, 2017

COUNTY COUNCIL FOR MONTGOMERY COUNTY, MARYLAND

Lead Sponsors: Councilmembers Elrich, Leventhal and Berliner Co-sponsors: Councilmembers Rice, Katz, Riemer, Navarro and Hucker

SUBJECT: Emergency Climate Mobilization

Background

- 1. Current global warming of approximately 1 degree Celsius has triggered cataclysmic changes to the Earth. These changes include an accelerating collapse of the West Antarctic Ice Sheet, the thawing of the Arctic permafrost, an increase in mega-droughts, heat waves, super-storms, flash flooding, the migration of mosquito-borne diseases, the melting of glaciers, polar ice-sheet collapse, coral bleaching, the mass extinction of species, ocean oxygen loss, and sea level rise.
- 2. Climate change will cause an increase in water and food shortages, civil unrest, state failure, civil war and terrorism throughout the world, with no region or nation being immune to these effects, including Montgomery County.
- 3. There is a strong consensus among scientists that greenhouse gas emissions must be eliminated in a decade at most -- with a simultaneous global effort to remove excess carbon from the atmosphere -- to stabilize at or near the 1.5 C (2.4 F) threshold believed to provide a reasonable chance for the survival of human civilization and other complex life forms on this planet.
- 4. The federal government, national media, and civil society, including most climate organizations, have drastically underestimated the urgency of the climate and ecological crises, failed to accept that we face an unprecedented global emergency, and relied on failed strategies of gradualism.
- 5. We must together implement a massive emergency global mobilization effort to successfully eliminate greenhouse gas emissions and remove excess carbon from the atmosphere.
- 6. Each of us has the moral duty to safeguard the planet for future generations.

Page 2 Resolution No.: 18-974

7. Montgomery County has been a national leader in responding to the challenge of climate change, including establishing a goal of reducing greenhouse gas emissions in the County by 80% by 2050 compared to 2005 levels, yet now needs to do much more, much faster.

Action

The County Council for Montgomery County, Maryland approves the following resolution:

The Montgomery County Council calls upon the national Administration, the Congress, the State, and other local governments to join Montgomery County, to use all available powers and resources to:

- 1. declare a climate emergency and initiate a massive global mobilization to restore a safe climate and build a sustainable economy; and
- 2. transform the climate by reducing greenhouse gas emissions by 80% by 2027 and reaching 100% elimination by 2035, and initiate large-scale efforts to remove excess carbon from the atmosphere.

The Montgomery County Council calls upon the Montgomery County Executive, Montgomery County Public Schools and Maryland-National Capital Park and Planning Commission to advise the Council over the next six months on specific methods for accelerating the County's greenhouse gas emissions reduction goal.

This is a correct copy of Council action.

Linda M. Lauer. Clerk of the Council



Transportation Actions

Montgomery County safely, affordably, and sustainably moves people and connects places.

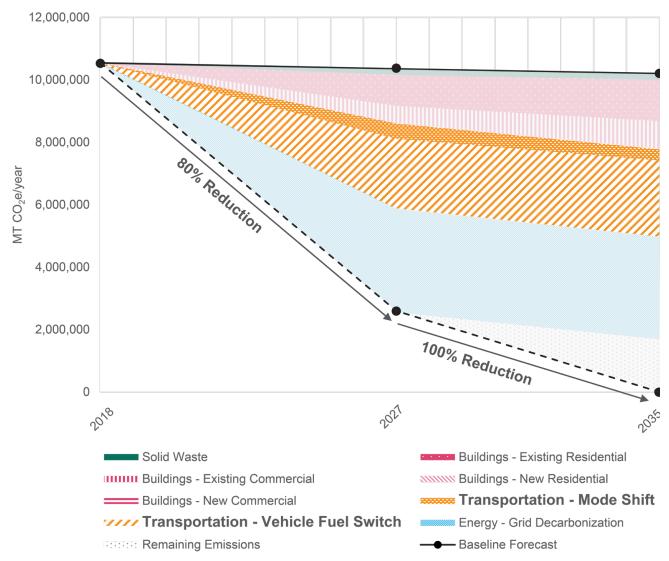
- Transition to 100% zero emissions transportation and expand supporting infrastructure.
- Provide clean, efficient, frequent, and reliable public transit.
- Reduce use of personal automobiles and increase use of transit and active transportation options like biking, walking, and micromobility services with safe, supportive infrastructure and land use, along with greater use of transportation demand management to achieve trip reduction.
- Introduce new technologies and approaches to transition to a green transportation system.

Transportation

Target: 100% zero emissions transportation options, including all private and public vehicles (for example, cars, trucks, buses) by 2035.

Reduce private vehicle trips from 75% of total trips (the 2018 base level) to 60% by 2027.

Double the proportion of bus, rail, and bicycle trips (or offset any deficit with increases in other micromobility, walking or telework) over the 2018 base levels of total trips by 2035.



This graph shows the approximate amount of GHG emissions the County will need to reduce in the transportation sector to meet its 2027 and 2035 climate goals, as modeled in CURB. The actions presented in this section will help the County reduce GHG emissions in this sector toward its climate goals and are ordered by descending GHG emissions reduction potential.



A GENERAL PLAN TO KEEP MONTGOMERY **COUNTY THRIVING FOR THE NEXT 30 YEARS**

THE PLAN VISION: Thrive Montgomery 2050 envisions a county that is more urban, more diverse, and more connected, providing a high quality of life for existing residents while also welcoming new residents and new ideas. Specifically, Montgomery County in 2050 consists of a web of Complete Communities connected by vibrant corridors. Individual and unique centers of neighborhood activity and urban nodes optimize land use with a variety of housing types and price points. Housing is located close to transit, workplaces, needed goods and services, public amenities and active park spaces. Two types of corridors connect these Complete Communities to the rest of the county: 1. multimodal transportation and services; and 2. green parks, stream valleys, and trails.





Racial Equity & Social Justice Policy and Office



The Mission

The Mission of the Office of Racial Equity and Social Justice is to reduce and eliminate racial disparities and inequities in Montgomery County.

The Purpose

The Office of Racial Equity and Social Justice (ORESJ) is a county-wide office focused on advancing racial equity and dismantling structural racism within County Government. The ORESJ was created in December of 2019 by The Racial Equity and Social Justice Act to help reduce and ultimately eliminate racial and other disparities experienced by residents of color across Montgomery County. We do this by supporting County Departments in normalizing conversations on race and other equity issues, organizing staff to work together for transformational change, and operationalizing new practices, policies and procedures that are equity centered impact plans.

We have been given the charge of facilitating the Racial Equity and Social Justice Committee, training County staff and Equity Leads, and conducting department-wide Equity Assessments to assist every department in creating Racial Equity Action Plans.

The Office of Racial Equity and Social Justice recognizes that it will take transformational shifts within government to truly address disparities experienced by communities of color and low-income communities, and therefore we focus our efforts on building capacity within the government to understand what it takes to advance racial equity within every County Department. We believe that equity is everyone's job, and our office provides training, technical assistance and tools to all of our County Departments and the staff.

Contact Us

Director: Tiffany Ward

Address: 101 Monroe Street, Rockville, MD 20850

Phone: 240-777-5334

MPIA Contact: Tiffany.Ward@montgomerycountymd.gov

Administrative Specialist II:

Andrea.Gardner@montgomerycountymd.gov

Program Manager, Training: TBD
Program Manager, Policy Analyst:
Sarah.Alvarez@montgomerycountymd.gov

Background

"Not everything that is faced can be changed, but nothing can be changed until it is faced" – James Baldwin

At first glance Montgomery County appears to be a bastion of wealth and opportunity. In fact, until very recently Montgomery County was the richest county in Maryland. Upon closer examination we found revealing disparities in education, housing, transportation, poverty and income.

In Montgomery County, white median household income (\$119,000) almost double that of Hispanic or Latinx (\$66,000) and Black or African American (\$62,000) households. White households earned approximately 10% more than Asian households (\$109,000). Source: American Community Survey 5-Year Estimates 2018

Black children in Montgomery County have a poverty rate more than 6x that of white children in Montgomery County. Source: ACS 5-Year Estimates 2018

More members of the white (72%) and Asian (67%) populations received bachelor's degrees compared to Black or African American (43%) and Hispanic or Latinx (25%) residents.

Similarly, more white (73%) and Asian (74%) populations own their homes in Montgomery County compared to Black or African-American (43%) and Hispanic or Latinx (49%) residents. Source: Latest Available ACS 1-Year Estimates 2016-2018

Data only partially helps us to understand these disparities, as a County government and as a community we need to center the lived experiences of members of communities of color. We must take an honest look at history, systems and institutions to analyze how disproportionality exists across all sectors and issue areas.

We will take a systems approach to our analysis ridding ourselves of the myth that individual people are the problem. We must understand that people are not the problem, it is the systems and

Attachment H

Letters of Support

Hydrogen Fuel Cell Buses and Fueling Site Montgomery County, Maryland

Low or No Emissions Grant Program 2022

Congress of the United States

Washington, DC 20510

May 18, 2022

Administrator Nuria Fernandez Federal Transit Administration 1200 New Jersey Avenue, S.E. Washington, D.C. 20590

Dear Administrator Fernandez:

We write to express our full support for Montgomery County's application to the Federal Transit Administration's Low or No Emission Vehicle Program for funding to create a new hydrogen production site and acquire 13 hydrogen fuel cell electric buses.

We understand that this use of hydrogen-electric technology will be the first public transit application on the East Coast, providing clean and efficient service. The 13 hydrogen-electric buses will support the first phase of Montgomery County's transition to hydrogen, expanding zero-emissions fleet capabilities today and in the future. The new green hydrogen production site will produce hydrogen from water, and then store it at the compression, storage, and dispensing site that will fuel the buses. These zero-emission buses, used within the Ride On service area, will convert the hydrogen to electricity to power the buses' electric motors, emitting only water from their tailpipes.

Montgomery County's application reflects its long-term commitment to addressing climate change by investing in advanced technologies that will be critical to reducing transportation-related greenhouse gas emissions. The project also aims to advance the goals of Montgomery County's Climate Action Plan to expand public transit and electrify public buses.

We request your full consideration of this application to support Montgomery County's clean energy initiatives, create high-quality jobs, improve safety, minimize its transit system's carbon footprint, and promote equitable economic opportunity.

Sincerely,

Benjamin L. Cardin United States Senator

Chris Van Hollen United States Senator Member of Congress

Anthony G. Brown Member of Congress

Jamie Raskin

Member of Congress

David J. Trone

Member of Congress



Marc Elrich
County Executive

May 16, 2022

The Honorable Pete Buttigieg, Secretary U.S. Department of Transportation 1200 New Jersey Avenue, S.E. Washington, D.C. 20590

Dear Secretary Buttigieg:

I am writing in strong support of the Montgomery County Department of Transportation's (MCDOT) application for funding through the Federal Transit Administration's Low or No Emission Grant Program for the Hydrogen Buses and Fueling Site Project. Upon successful award of the grant, Montgomery County will provide the local funding match required for this project.

This project is a critical step in the County's transition to a zero-emissions fleet by 2035. The new green hydrogen production site will use water to produce hydrogen, which will then power 13 new hydrogen fuel cell buses. These zero-emission buses convert hydrogen to electricity to power electric motors and emit only water from their tailpipes. The addition of fuel cell buses, alongside existing and planned battery-electric buses, will enable MCDOT to provide clean, sustainable, and reliable bus service for our county of over one million residents. Hydrogen buses will allow for needed coverage of longer bus routes since they provide a longer range of service than electric buses, with a shorter refueling time.

Montgomery County's track record of innovation and sustainability means we are well-positioned for success. The David F. Bone Equipment Maintenance Transit Operations Center, the LEED GOLD facility that will house the hydrogen production site, has received numerous awards, including the Engineering News Record 2014 Best Project award. The hydrogen fuel project will be a strong addition to the transit facility and the 30-mile proximity to the U.S. Capitol makes it ideally suited for demonstrating hydrogen fuel technology to a range of interested parties.

The urgency of climate change inspires us to serve as a model for other jurisdictions. This project will make the County a leading adopter of green hydrogen with the largest transit application of this clean technology on the East Coast.

The County's Climate Action Plan goals—to reach an 80 percent reduction in greenhouse gas emissions by 2027 and a 100 percent reduction by 2035—are among the most ambitious in the country. Meeting these goals requires investing in innovative projects like this one. This project will create high-quality jobs, improve safety, protect our environment, and make the air cleaner, especially for our most vulnerable residents.

The Honorable Pete Buttigieg May 16, 2022 Page 2 of 2

I appreciate USDOT's commitment to funding high-quality projects with visible and sustainable community benefits, and I urge you to support funding this worthy project.

Sincerely,

Marc Elrich

County Executive

MONTGOMERY COUNTY COUNCIL ROCKVILLE, MARYLAND

OFFICE OF THE COUNCIL PRESIDENT

May 16, 2022

The Honorable Pete Buttigieg, Secretary U.S. Department of Transportation 1200 New Jersey Avenue, S.E. Washington, D.C. 20590

Dear Secretary Buttigieg:

We are writing in strong support of the Montgomery County Department of Transportation's (MCDOT) application for funding through the U.S. Department of Transportation's Low or No Emission Grant Program for the Hydrogen Buses and Fueling Site Project. Upon successful award of the grant, Montgomery County will provide the local funding match required for the project.

Climate change is the most existential threat of our lifetimes, and we must be leaders in the efforts to reduce pollution and create a healthier and more equitable future. Cutting emissions from fossil fuel-powered vehicles is a crucial step toward protecting the health of communities and this project is an important step in the County's transition to a zero-emission fleet.

This project's construction of a hydrogen fuel production system and fueling station and procurement of 13 hydrogen fuel cell transit buses will be the largest public transit application of green hydrogen fuel produced on-site on the East Coast. The addition of the fuel cell buses, alongside existing and planned battery-electric buses, will enable MCDOT to provide clean, sustainable, and reliable bus service across the county.

Responding to the threat of climate change goals requires a strong commitment to investing in innovative, sustainable technology. This project is an important and needed investment in our community.

We appreciate USDOT's commitment to funding high-quality projects with visible and sustainable community benefits, and we urge you to support funding this worthy project.

Sincerely,

Gabe Albornoz

President, Montgomery County Council





2425 Reedie Drive Floor 14 Wheaton, MD 20902



MontgomeryPlanningBoard.org

May 13, 2022

The Honorable Pete Buttigieg, Secretary

U.S. Department of Transportation 1200 New Jersey Avenue, S.E. Washington, D.C. 20590

Dear Secretary Buttigieg:

I am writing in support of Montgomery County Department of Transportation's application for funding through the Federal Transit Administration's Low or No Emission Grant Program for the Hydrogen Buses and Fueling Site Project. I strongly support the innovative approach by the department to advance the county's Climate Action Plan goals.

Montgomery County has made progress in reducing its greenhouse gas emissions, a key contributor to climate change, but has much farther to go to meet its goal of eliminating these emissions by 2035. The county must lead by example in the transportation sector with a full transition to a zero-emission fleet, and this project is a critical step on that path. The addition of hydrogen fuel cell buses, alongside existing and planned battery-electric buses, will enable the county to provide diversified, sustainable and reliable bus service for its one million residents.

In the face of climate change, we need creative strategies to build resilience and improve sustainability. Montgomery County's project will be the first green hydrogen transit application on the East Coast, making the county a leading adopter of this clean technology. The county is well-positioned to make the decisions and investments necessary for this project's success.

We appreciate USDOT's commitment to funding high-quality projects with visible and sustainable community benefits, and we urge you to support funding this worthy project.

Sincerely,

Casey Anderson

Chair



May 16, 2022

Nuria Fernandez Administrator Federal Transit Administration 1200 New Jersey Ave, SE Washington, D.C. 20590

Re: FY 2022 Low or No Emission (Low-No) Grant Program Grant Application by Montgomery County, Maryland for the Hydrogen Buses and Fueling Site Project

Dear Administrator Fernandez:

I am writing to express the support of the National Capital Region Transportation Planning Board (TPB), the Metropolitan Planning Organization (MPO) for the National Capital Region, for an application by Montgomery County, Maryland for a Low or No Emission (Low-No) Grant Program grant for the Hydrogen Buses and Fueling Site Project.

Montgomery County proposes to acquire 13 new hydrogen fuel cell electric buses (FCEBs) and develop a new green hydrogen production site and dispensing station at the David F. Bone Equipment Maintenance and Transit Operations Center in Gaithersburg, Md. to support the County's bus transit service operations. Montgomery County's project will be the first green hydrogen transit application on the U.S. East Coast, making the County a leading adopter of this clean technology. Hydrogen fuel production at this site will be greener than traditional fossil fuel-based hydrogen production, as the hydrogen fuel will be produced from water using zero-emission electrolysis.

The project proposed for this grant directly responds to the regional transportation goals adopted by the TPB and identified in the Washington region's long-range transportation plan, Visualize 2045. The TPB has long supported increased investment of transportation dollars to support improvements in the environment and the region's bus system. New buses using zero emissions systems will provide benefits to the region's citizens and visitors through cleaner and higher quality public transportation service. The support and promotion of electric vehicles and of public transportation are key strategies of our adopted Regional Transportation Priorities Plan.

The TPB requests your favorable consideration of this request by Montgomery County. I anticipate that upon a successful grant award, subject to the availability of the required matching funding, the region's transportation improvement program (TIP) will be amended to include the grant funding for this project.

Sincerely,

Pamela J. Sebesky

Hamela sebesky

Chair, National Capital Region Transportation Planning Board

Cc: Mr. Chris Conklin, Director, Montgomery County Department of Transportation



GINO RENNE PRESIDENT

LISA BLACKWELL-BROWN SECRETARY-TREASURER

LISA TITUS RECORDER

WWWMCGEO,ORG

May 4, 2022

The Honorable Pete Buttigieg, Secretary U.S. Department of Transportation 1200 New Jersey Avenue, S.E. Washington, D.C. 20590

Dear Secretary Buttigieg:

On behalf of UFCW Local 1994 MCGEO (MCGEO), I am writing to express my support of the Montgomery County Department of Transportation's (MCDOT) application for funding through the Federal Transit Administrations's Low or No Emissions Grant Program for the Hydrogen Bus and Fuel Site Project.

As part of its commitment to transitioning to a zero-emissions bus fleet, MCDOT will construct a new green hydrogen production site that will fuel 13 new hydrogen fuel cell buses. One of the main benefits for using hydrogen is the lack of emissions produced—heat and water vapor are the only emissions from hydrogen buses. Hydrogen is safer than other fuels for workers, bus riders, and the community. MCDOT's project will establish the County a regional leader in the adoption of this new technology. Importantly, the project dedicates 5.5 percent of its budget to workforce development, representing \$1.6 million over the life of the project.

MCGEO is a labor union representing approximately 9,000 workers in Maryland, primarily in public service. We are committed to advancing the economic interests of our members, their families and the communities we serve through the collective bargaining, legislative, political, and organizing processes; adding value to the work experience and building a stronger, more vibrant community. We pursue policies and objectives to sustain and protect an effective infrastructure of public services – education, health, recreation, transportation, commerce and public safety – which improve and enrich the quality of life for all.

MCGEO has partnered with MCDOT in the development of its Zero Emissions Fleet Transition Plan and considers itself a critical partner in the endeavor to build a sustainable future fleet. MCGEO recognizes this project is an important and needed investment in Montgomery County. It will create union jobs, enhance worker skills and safety, protect our environment and help meet the goals of the Montgomery County's Climate Action Plan to expand public transit and electrify public buses.

We appreciate your consideration and urge you to fund this worthy project.

Sincerely,

Gino Renne

President, UFCW Local 1994 MCGEO Vice President, UFCW International Union



Larry Hogan, Governor Boyd K. Rutherford, Lt. Governor Mary Beth Tung, Director

May 17, 2022

The Honorable Pete Buttigieg, Secretary U.S. Department of Transportation 1200 New Jersey Avenue, S.E. Washington, D.C. 20590

Dear Secretary Buttigieg:

On behalf of Maryland Energy Administration (MEA), we are pleased to express our support for the Montgomery County Department of Transportation's (MCDOT) application for funding through the Federal Transit Administration's Low or No Emissions Grant Program for new green hydrogen production and storage/dispensing site and hydrogen fuel cell electric buses.

Clean, resilient, and efficient energy projects like Montgomery's Hydrogen Fueling Station and Bus Project are our agency's mission in action: promoting affordable, reliable, and cleaner energy for Maryland. They are also important proofs-of-concept, demonstrating how comprehensive energy projects that incorporate clean generation, efficient energy use, resiliency enhancements, and smart control systems are essential to modernizing our grid and improving societal access to affordable and sustainable energy solutions. MEA has provided, as part of our Resilient Maryland Program, initial seed funds to begin the feasibility analysis for this activity to help ensure the project is prepared for investment.

This project will be the latest in a series of clean energy, energy efficiency, and resiliency projects that Montgomery County has undertaken to meet its energy and sustainability goals. The County has been an early adopter of clean energy technology and has successfully partnered with MEA on numerous past projects. MEA will work closely with the County as they implement this project and use it to inform future programs, policies, standards or guidance statewide.

MEA supports Montgomery County's efforts to implement innovative clean energy solutions and encourages the U.S. Department of Transportation to consider the County's application for grant funding favorably and help foster a new green hydrogen production and storage dispensing site and hydrogen fuel cell electric buses.

Sincerely,

Mary Beth Tung, Ph.D., Esq.

May But Jung

Director



COMMISSIONERS
Keith E. Bell, Chair
Howard A. Denis, Vice Chair
Fausto R. Bayonet
T. Eloise Foster
Chris Lawson
Regina Y. Speed-Bost

GENERAL MANAGER Carla A. Reid

May 9, 2022

Mr. Pete Buttigieg
Secretary of Transportation
U.S. Department of Transportation
1200 New Jersey Avenue, S.E.
Washington, D.C. 20590

Re: Montgomery County, Maryland RAISE Grant Application

Dear Secretary, Buttigieg:

I am writing to express my strong support for the Montgomery County Department of Transportation's application for funding through the Federal Transit Administration's Low or No Emissions Grant Program for new green hydrogen production and storage/dispensing site and hydrogen fuel cell electric buses.

Hydrogen is now being called the super fuel of the future. Clean hydrogen production will play a major role as we move away from the carbon economy and fossil fuel dependency. The use of hydrogen-electric technology will be the first public transit application on the East Coast, providing clean, efficient, frequent, and reliable service. The new green hydrogen production site will produce hydrogen from water, and then store it at the compression, storage, and dispensing site that will fuel the 13 buses. Fuel-cell electric vehicles are zero-emission vehicles. When a hydrogen fuel-cell electric bus operates, it emits only water. This means cleaner air, less global warming, and healthier, quieter neighborhoods. Long-range and quick refueling times are among the main advantages of hydrogen fuel cell buses compared to battery electric vehicles.

This project is an important and needed investment in our community. It will protect our environment and help meet the goals of the County's Climate Action Plan to expand public transit and electrify public buses. We are excited about the future of Hydrogen Fuel and looking forward to partnering with the Montgomery County Department of Transportation in the future.

I appreciate your consideration of this application and request your support for this important project.

Sincerely,

Al Roshdieh

Director, General Services Department



Pepco 701 Ninth Street NW Washington, DC 20068-0001

May 12, 2022

The Honorable Peter Buttigieg Secretary of Transportation 1200 New Jersey Avenue, SE Washington, DC 20590

Re: Low or No Emissions Grant Program for Buses

Dear Secretary, Buttigieg:

On behalf of Potomac Edison Power Company ("Pepco"), we are pleased to express our support for the Montgomery County Department of Transportation's ("MCDOT") application for funding through the Federal Transit Administration's Low or No Emissions Grant Program for a new green hydrogen production and storage/dispensing site and hydrogen fuel cell electric buses.

Based in the District of Columbia, Pepco is a subsidiary of Exelon Corporation. Exelon's six utilities – Pepco, Atlantic City Electric, BGE, ComEd, Delmarva Power and PECO – deliver electricity and natural gas to approximately 10 million customers in the District of Columbia, Delaware, Illinois, Maryland, New Jersey, and Pennsylvania. Environmental stewardship and sustainability are fundamental principles that guide Pepco's business and enable our success, both for today and into the future. Not only are we committed to delivering safe, reliable and affordable electricity, equitably and inclusively, we are also actively involved in collaborations that seek a cleaner, more sustainable, and equitable future. Pepco recognizes the role we can and will have in shaping the future of energy service, combating climate change, and enhancing the resiliency of the electric distribution system for our customers and communities we are privileged to serve.

Hydrogen, the most abundant element in the universe, is now being called the super fuel of the future. Clean hydrogen production, along with clean and efficient electrification, will have a major role as we move away from a carbon economy and fossil fuel dependency. The use of hydrogen-electric technology will be the first public transit application on the East Coast, providing clean, efficient, and reliable service. The new green hydrogen production site will fuel 13 mass transportation buses. Pepco recognizes the importance of the electrification of the transportation sector and views itself as a critical partner in this endeavor. We applaud MCDOT's commitment to cleaner air, less global warming, and healthier, quieter neighborhoods.

Pepco recognizes that this project is an important and needed investment in Montgomery County. It will protect our environment and help meet the goals of the Montgomery County's Climate Action Plan to expand public transit and electrify public buses. We are excited about the future of Hydrogen Fuel and are looking forward to partnering with the MCDOT in the future.

Pepco fully supports the application of MCDOT to the United States Department of transportation to fund a new green hydrogen production and storage dispensing site and hydrogen fuel cell electric buses.

Sincerely,

Donna Cooper

Pepco Region President



May 13, 2022

Hon. Secretary Pete Buttigieg US Department of Transportation (USDOT) 1200 New Jersey Avenue SE Washington DC, 20590

RE: Montgomery County Application to the Federal Transit Administration's Bus and Bus Facilities Grant Program

Dear Hon. Secretary Buttigieg:

Baltimore Gas and Electric (BGE) through this letter is pleased to support the Montgomery County Department of Transportation's (MCDOT) application for funding through the Federal Transit Administration's (FTA) Low or No Emissions Grant Program for MCDOT's Hydrogen Buses and Fueling Site project (Project).

BGE is the largest energy utility in Central Maryland, with roughly 1.4-million customers, employing about 3,200 employees in the region, and serving a portion of the County. BGE and its affiliate, Potomac Edison Power Company, which serves the majority of the County, are both subsidiaries of Exelon Corporation, the nation's largest utility company. BGE has a history of more than 200 years of service, and a long-standing commitment to our customers and the community. That support continues through BGE's Path to Clean, our commitment to lead Maryland to a clean and sustainable future by cutting our own operational emissions by at least 50 percent by 2030 and achieving net-zero operations-driven emissions by 2050, while continuing to support our customers in reaching their clean energy goals.

It is with this backdrop that BGE supports the County's Project, which will bring to Maryland 13 zero-emission, state-of-the-art, hydrogen fuel cell electric buses (FCEBs) and construct a hydrogen fuel production and dispensing station (Station) in Gaithersburg, Maryland to support the County's bus transit service operations. Of particular significance, the Station will produce *green* hydrogen from water, using zero-emission electrolysis. BGE understands that MCDOT's FCEBs will reduce the County's annual greenhouse gas emissions by approximately 640 tons and prevent the release of 7.1 pounds particulate matter under 2.5 micrometers (PM2.5).

MCDOT's Project illustrates the value of pursuing decarbonization strategies that rely on a diverse mix of energy sources, including through new, innovative, groundbreaking transportation and fuel options that can meet the needs of all Marylanders in our diverse communities, with varied transportation needs. BGE is proud to support MCDOT's Project application as an important step to continue Maryland's transition to a clean and sustainable future.

Sincerely,

Divesh Gupta

Director of Strategy, Utility of the Future

cc: Chris Brown, Chief, Office of Energy and Sustainability, Montgomery County Department of General Services



May 16, 2022

The Honorable Pete Buttigieg, Secretary U.S. Department of Transportation 1200 New Jersey Avenue, S.E. Washington, D.C. 20590

Dear Secretary Buttigieg:

We are writing in strong support of the Montgomery County Department of Transportation's (MCDOT's) application for funding through the Federal Transit Administration's Low or No Emission Grant Program for the Hydrogen Buses and Fueling Site Project. The Coalition for Smarter Growth advocates for walkable, inclusive, and transit-oriented communities as the most sustainable and equitable way for the Washington, D.C. region to grow and provide opportunities for all.

Montgomery County recognized the need to reduce carbon emissions and adopted a plan to transition to a 100 percent zero emission fleet of buses by 2035. This project is a critical step in the path to a clean, reliable fleet. The addition of hydrogen fuel cell buses, alongside existing and planned battery-electric buses, will enable the County to provide sustainable and reliable bus service across for its one million residents.

Montgomery County has long been an innovator when it comes to forward-thinking, progressive policy solutions. Innovative projects, like the Hydrogen Bus and Fuel Site Project, are a must-have for the county to thrive as a sustainable, equitable and economically-competitive community.

This project is about more than just transportation — it's about improving quality of life for all Montgomery residents. Eliminating emissions from fossil fuel powered vehicles is a necessary step toward protecting the health of communities. The project's 13 fuel cell buses will reduce greenhouse gas emissions and prevent the release particulate matter, making our air cleaner.

We appreciate USDOT's commitment to funding high-quality projects with visible and sustainable community benefits, and we urge you to support funding this worthy project.

Sincerely,

Jane Lyons
Maryland Advocacy Manager
Coalition for Smarter Growth



May 13, 2022

The Honorable Pete Buttigieg, Secretary U.S. Department of Transportation 1200 New Jersey Avenue, S.E. Washington, D.C. 20590

Reg: Montgomery County Department of Transportation's application for funding through the Federal Transit Administration's Low or No Emission Grant Program for the Hydrogen Buses and Fueling Site Project.

Dear Secretary Buttigieg,

Sierra Club Montgomery County Maryland Group is writing in strong support of Montgomery County Department of Transportation's application for funding through the Federal Transit Administration's Low or No Emission Grant Program for the Hydrogen Buses and Fueling Site Project.

The climate crisis is the challenge of our lifetime. Montgomery County's Climate Action Plan calls for the transition to a 100 percent zero emission fleet of buses by 2035. This project is a critical step in the path to a clean, reliable fleet. Cutting emissions from fossil fuel powered vehicles is a crucial step toward protecting the health of communities.

This project's 13 hydrogen fuel cell buses, and construction of a hydrogen fuel production and dispensing station in Gaithersburg, will support the County's bus transit operations, prevent the release of particulate matter, and make our air cleaner. Because the Gaithersburg/Rockville area is host to several of our life sciences, medical and educational institutions, an added benefit of this clean-energy transit project will be connecting underserved communities to healthcare, education and jobs.

Important to note is that fuel cell buses are well-suited for longer bus routes. Based on today's battery performance, the County could expect to reliably operate only 28% of its routes with battery electric buses; however, fuel cell buses could operate on all routes. The addition of hydrogen fuel cell buses, alongside existing and planned battery-electric buses, will enable the County to provide sustainable and reliable bus service across its one million residents.

Sierra Club believes this project will help address climate change. In addition to the benefit of using zero-emission vehicles, Sierra Club also wants more people to use public transit, which can convey many more people in much less space than individual automobiles, which keeps traffic congestion lower, which in turn reduces air pollution caused by vehicles idling.

The National Capital region is looking to Montgomery County, with its track record of sustainability and innovation, to take the lead in implementing this new clean fuel technology. The hydrogen fuel production at this site will be greener than traditional fossil fuel-based hydrogen production, as the hydrogen fuel will be produced from water using zero-emission electrolysis. We would be proud for Maryland to become the East Coast hub of the clean energy economy.

We appreciate USDOT's commitment to funding high-quality projects with visible and sustainable community benefits, and we urge you to support funding this worthy project.

Sincerely,
Shruti Bhatnagar, Chair
Sierra Club Montgomery County, Maryland
Shruti.bhatnagar@mdsierra.org | 240.498.3459

Tina Slater, Transportation Lead Sierra Club Montgomery County, MD slater.tina@gmail.com

Attachment I

Project Management Plan and Timeline

Hydrogen Fuel Cell Buses and Fueling Site Montgomery County, Maryland

Low or No Emissions Grant Program 2022



FTA Low- or No-Emission Vehicle Program (Low-No)

Introduction

Zero-emission buses have specific operating characteristics and fueling requirements that can pose challenges for transit agencies unfamiliar with these technologies. Ensuring a successful deployment of zero-emission buses requires additional steps beyond what is typically required for conventional fueling technologies. The Center for Transportation and the Environment (CTE) developed a high-level Project Management Plan that will be used to guide Montgomery County to complete the 2022 FTA Low-No Application.

Project Management Plan

The proposed project will be executed in nine primary tasks, summarized as follows:

Task 1: FTA Award and Project Consultant Contract Execution

FTA will grant pre-award authority to incur costs related to planning and design activities beginning on the date of project announcement and will provide specific guidance to recipients at the time of selection. Upon award, Montgomery County will execute a contract with CTE. Procurement of buses through a competitive procurement and fueling equipment and design/build services from Trillium shall begin after the TrAMS submittal is approved by FTA the procurement requirements are defined in Task 3 of the project management plan. The expected timeframe for this task is at least three months from the time that FTA announces the awardees.

Task 2: Project Planning and Initiation

CTE will guide the project team in project planning activities. This task will result in a formal kick-off of the project with all stakeholders and project team members to align the project team on objectives, tasks, assignments, timelines, and expectations to successfully meet project goals and objectives.

Task 3: Requirements Analysis

This task confirms the technical specifications for the bus and fueling equipment. CTE will evaluate the required range of the bus based on the duty cycle of scheduled routes and will determine daily fuel consumption and throughput requirements necessary to support deployment given Montgomery County's fueling window. CTE will model Montgomery County's routes and available OEM bus configurations to predict the range and performance of the bus on the target routes. The model uses powertrain simulation software, such as Autonomie, which was developed by Argonne National Laboratory for the heavy-duty trucking industry and modified by CTE for zero-emission transit buses. CTE will collect route data by riding selected routes on an existing Montgomery County bus with a GPS data logger to capture time, distance, speed, acceleration, GPS coordinates, and grade. CTE will also collect data on local environmental conditions, passenger loading profiles, route planning details, and blocking schedules from the agency. CTE will use this data along with specifications for the available OEM bus configurations to simulate bus operations on agency routes. The results of the simulation provide the agency with information to be used as a guide for making operational decisions and to determine if any changes are required to the bus specifications, routes, or passenger service schedules in order to optimize bus operations and



FTA Low- or No-Emission Vehicle Program (Low-No)

operating costs. CTE might also be able to arrange for a test drive of a fuel cell electric bus to confirm vehicle performance and fuel efficiency on specific routes.

Additionally, CTE will provide a preliminary assessment of required upgrades to mechanical and electrical systems and installation of hydrogen detection and alarm systems in maintenance buildings to safely maintain hydrogen-fueled buses, leading to the procurement of a qualified engineering firm to prepare detailed plans and drawings.

Task 4: Bus Procurement & Build

Montgomery County shall issue a Request for Proposals to select a bus OEM for their Low-No project. CTE shall support Montgomery County to ensure the unique characteristics of zero-emission buses are addressed in the solicitation materials, including preparation of technical specifications. CTE will also assist Montgomery County in the technical review of proposals received from bus manufacturers to ensure that Montgomery County understands the performance capabilities of each proposed bus model.

Once the bus manufacturer has been identified, selected through an RFP, Montgomery County shall conduct a pre-award Buy America audit.

Montgomery County and the OEM will execute a procurement contract for the buses awarded through the Low-No program. The OEM will submit their final design to Montgomery County for approval before proceeding with production. Montgomery County and CTE will participate in a preproduction meeting at the OEM's facilities to confirm the design and to review quality assurance, quality control, and production procedures that will be in place for this order. CTE will monitor the progress of the bus build to ensure the timing aligns with the commissioning of the fueling station.

As Montgomery County is procuring more than 10 buses, the county will ensure a trained in-plant inspector is present to meet the FTA procurement requirements.

Once the buses are delivered, Montgomery County shall conduct a post-delivery Buy America audit.

Task 5: Infrastructure Procurement, Design, and Build

CTE will assist Montgomery County as it finalizes the specifications for the hydrogen station, including production, compression, storage, and dispensing. This includes the preparation of necessary documents required for procurement of fueling station vendor equipment. Note that Trillium will be responsible for the design and build of the hydrogen fueling station.

CTE will prepare specifications for the A&E contractor providing engineering services to design and manage the maintenance facility upgrades for the safe storage and maintenance of fuel cell electric buses. This includes the preparation of necessary documents required for procurement of services for necessary maintenance facility upgrades. Upgrades to facilities will require an A&E firm to prepare engineering drawings and obtain building permits, followed by an independent contractor to be responsible for installation.

CTE will work with Montgomery County to provide administrative oversight and technical reviews during the design, construction, and installation process for the hydrogen refueling station and



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required maintenance upgrades. Trillium will develop site and installation plans for the station and obtain all necessary permits.

CTE will also assist the transit agency in establishing and coordinating a third-party, independent safety review of preliminary fueling station design plans prepared by the vendor. The review is expected to be conducted by the American Institute of Chemical Engineers Center for Hydrogen Safety, and cost of conducting this review will be the responsibility of Trillium.

CTE will also work with Trillium and the selected bus OEM to provide a seamless fueling interface that will meet Montgomery County's requirements for refueling its fleet. Trillium will also work with Montgomery County and local utilities to provide the necessary utilities to operate the station.

Once the site preparation for the station is completed, Trillium will install and commission the equipment, during which CTE will coordinate weekly communication meetings and provide project overview and recommendations. CTE will organize and coordinate with Montgomery County, the bus OEM and Trillium, to complete first-responder and employee safety and operations training.

Task 6: Bus and Infrastructure Deployment

CTE will work with Montgomery County to develop a plan for post-delivery acceptance and performance validation testing, as well as for beginning revenue service. Delivered buses will be registered and insured by Montgomery County. Montgomery County will conduct post-delivery inspections and acceptance testing. Montgomery County staff will receive the necessary training to operate and maintain the vehicles and hydrogen fueling station. Training, including first responder training, will be coordinated through the bus OEM and Trillium. Once buses and the fueling station have completed testing and acceptance by Montgomery County, CTE will work with Montgomery County and the bus OEM to validate the performance and operation of the buses and fueling station through CTE's performance validation approach. Performance validation tests will include route validation, where buses are operated along the planned route under controlled conditions (temperature, AC load, passenger load, traffic patterns, etc.) to validate the bus against the performance specification and/or modeling results. Station validation will be addressed as well, evaluating station throughput (buses fueled during fueling window), speed of fueling (kg/minute and buses fueled per hour), and state of fill (mass dispensed into the buses). Once buses and the fueling station have completed testing and acceptance by Montgomery County, they will be transitioned into passenger service.

Task 7: Deployment Validation

CTE will collect various data parameters to measure operational performance and realized benefits (e.g. actual energy savings, cost savings, and greenhouse gas emissions reductions) resulting from deployment of zero-emission buses into passenger service. The data will be used to generate a series of Key Performance Indicators (KPIs) to validate performance of zero-emission buses against other buses in Montgomery County's fleet. KPIs may include availability, reliability, energy efficiency, fuel costs, maintenance costs, and emission reduction. Fueling station metrics will include those previously referenced in Task 6 and an evaluation of station uptime, energy consumption, station efficiency, cost, ease of operation, and overall performance. These indicators, when combined, will allow Montgomery County and FTA to fully understand operational metrics to



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determine if the projected benefits, including impact on emissions, reductions in fuel consumption and cost, and reductions in maintenance and costs, have been realized from the deployment of the zero-emission buses. The analysis will also evaluate bus and fueling station performance to determine any impacts to service levels, operations, and operating costs. By tracking and analyzing theses KPIs, Montgomery County and FTA will be more informed regarding the overall impact of the zero-emission buses. Data logging hardware and data access services shall be supplied by the bus OEM, and implemented prior to bus delivery to ensure that critical data are collected to support evaluation and management of ZEB operations.

Task 8: Project Close-out

After the data collection period is over, CTE will issue a final report to Montgomery County summarizing project results, findings, and lessons learned. Montgomery County will close out the project with FTA.

Task 9: Project Management, Administration, Reporting, and Control

The detailed Project Management Plan developed at the start of a project will describe the project control procedures that will be employed to guide the effective and efficient management of the project. Many of the components of the Project Management Plan incorporate elements of FTA's Quality Management System. This plan will be incorporated into a project workbook that includes the roles, responsibilities, project schedule, task and milestone descriptions, and assignments.

Montgomery County will be responsible for overall project management with support from CTE and Trillium. Some of the tools that may be used are discussed below:

<u>Collaboration Tools:</u> Montgomery County will provide an online, cloud-based, collaborative project management website to share project files and communications, coordinate tasks, track issues, and maintain project calendars.

<u>Communications Plan:</u> Team members will participate in weekly or bi-weekly conference calls to discuss project status and current issues. Meeting minutes will be taken and stored on a cloud storage service. Zoom virtual meetings will be employed to share agendas and presentations.

Reporting Plan: CTE will prepare with Quarterly Management Reports (QMRs) for submittal to Montgomery County (and ultimate submittal to FTA). The QMRs provide a summary of progress and accomplishments of the previous quarter and projections for the remainder of the project. The QMR will be structured to allow Montgomery County to easily incorporate the information into the required FTA Quarterly Report submitted by Montgomery County. The QMR will document project progress and activities as well as describe any known risks and plans for mitigation.

CTE will compile the QMRs with input from team members. Information provided through the QMR includes

- Summary narrative of accomplishments by task/milestone during the period
- Estimated percent completion and expected completion dates of task/milestone
- Significant events affecting progress and discussion of project variances
- Projected activities for the next quarter



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CTE will also compile a Final Management Report at the end of the project to summarize the project accomplishments, realized benefits, and lessons learned.

Montgomery County Low No 2022 Project Timeline



WBS	Task Name	Duration	Start Date	End Date																		
								Q4		Q2	Q3 Q4				Q4				Q4 (Q1 Q		Q4
1	● FTA Award and Project Consultant Contract Execution	94d	08/15/22	12/30/22																		
2	Project Planning and Initiation	200	01/03/23	01/31/23																		
3	Requirements Analysis	42d	02/01/23	03/31/23																		
4	Bus Procurement and Build	583.50	04/03/23	07/30/25																		
5	★ Infrastructure Procurement, Design, Build, Inspection, & Training	605d	02/01/23	06/30/25																		
6	Bus and Infrastructure Deployment	21.50	07/01/25	07/31/25																		
7	Deployment Validation	333d	06/02/25	09/30/26														_	=	=	_	4
8	● Project Close-out	61d	10/01/26	12/31/26																		
9	+ Project Management and Reporting	1001d	01/03/23	12/31/26								-		-	-				_	_	_	=

Montgomery County Low No 2022 Project Timeline



WBS	Task Name	Duration Start Date	End Date	20		4 01	2023 Q2 Q3	04 01	202			025	1 01	202	
1	FTA Award and Project Consultant Contract Execution	94d 08/15/22	12/30/22	QZ.	Q3 Q	7 01	Q2 Q3	QT Q1	QZ.	Q5 Q+	Q1 Q2	Q0 Q-	1 (2)	QZ.	20 04
1.1	FTA Award Announcement	0 08/15/22	08/15/22		•										_
1.2	Prime Recipient Contract Complete	60d 08/15/22	11/08/22		1										_
1.3	Partner Contracts Complete	34d 11/09/22	12/30/22												_
2	Project Planning and Initiation	20d 01/03/23	01/31/23												
2.1	Project Planning Workshop	5d 01/03/23	01/09/23												
2.2	Create Project Workplan & Workbook	10d 01/10/23	01/24/23												
2.3	Prepare & Schedule Project Kick-off	4d 01/25/23	01/30/23												
2.4	Conduct Project Kickoff	1d 01/31/23	01/31/23												
3	Requirements Analysis	42d 02/01/23	03/31/23												
3.1	Route evaluation, selection & Data Collection	6d 02/01/23	02/08/23												
3.1.1	Review Bus Routing Recommendation	2d 02/01/23	02/02/23												
3.1.2	Route Confirmation Workshop	2d 02/03/23	02/06/23			11									
3.1.3	Collect Route Data	2d 02/07/23	02/08/23												
3.2	Route Modeling & Analysis	10d 02/09/23	02/23/23												
3.2.1	Present Modeling & Analysis	10d 02/09/23	02/23/23												
3.3	Define bus & fueling requirements	26d 02/24/23	03/31/23												
3.3.1	Bus/Fueling Requirements Definition Workshop	1d 02/24/23	02/24/23												
3.3.2	Draft Bus/Fueling Requirements	12.5d 02/27/23	03/15/23												
3.3.3	Review/Revise/Finalize Bus Requirements	12.5d 03/15/23	03/31/23												
4	Bus Procurement and Build	583.5d 04/03/23	07/30/25					_							
4.1	Bus Procurement	40d 04/03/23	05/26/23												
4.1.1	Review/Update Bus specifications	40d 04/03/23	05/26/23												
4.1.1.1	Draft Bus Specifications	15d 04/03/23	04/21/23				<u></u>								
4.1.1.2	Review/Revise Draft Specifications	10d 04/24/23	05/05/23				4								
4.1.1.3	Transit Agency Specification Review	10d 05/08/23	05/19/23				4								
4.1.1.4	Revise & Finalize Specifications	4d 05/22/23	05/25/23				Ļ								
4.1.1.5	Approve Bus Specifications	1d 05/26/23	05/26/23				Ļ								
4.1.2	Bus Procurement	71.5d 05/30/23	09/11/23												
4.1.2.1	Pre-Award Buy America Audit	20d 05/30/23	06/27/23				1								
4.1.2.2	Recommend Bus Award	1.5d 06/28/23	06/29/23				ļ								
4.1.2.3	Approve Bus Award	20d 06/29/23	07/28/23				1								
4.1.2.4	Execute Bus contract	30d 07/28/23	09/11/23				<u> </u>								
4.2	Bus Build	472d 09/11/23	07/30/25												
4.2.1	OEM Design	241d 09/11/23	08/26/24				i			_					
4.2.2	Pre-Production Review Meeting & NTP	1d 08/26/24	08/27/24							Ļ					
4.2.3	Review & Acceptance of Bus Design	21d 08/27/24	09/26/24							<u> </u>					
4.2.4	Oversight of Bus Build	120d 12/24/24	06/17/25												
4.2.5	Bus Inspections & Quality Assurance Oversight	120d 12/24/24	06/17/25									4			
4.2.6	Pre-delivery Acceptance of Vehicles	5d 06/17/25	06/25/25									ļ			
4.2.7	Deliver Vehicles	3d 06/25/25	06/30/25									à			
4.2.8	Post Delivery Buy America Audit	21d 06/30/25	07/30/25												
5	Infrastructure Procurement, Design, Build, Inspection, & Training	605d 02/01/23	06/30/25												
5.1	Design	120d 02/01/23	07/24/23												
5.2	Equipment Purchase / Manufacture	397d 03/16/23	10/10/24							7					
5.3	Upgrade Utilities	100d 03/16/23	08/07/23												
5.4	Permitting & Contractor Selection	80d 08/08/23	11/30/23				1								
5.5	Hydrogen Fueling Station Construction	120d 10/11/24	04/07/25							1					

WBS	Task Name	Duration	Start Date	End Date		20:	22		2023	202	4		202	25	2026	
									Q1 Q2 Q3		Q3 Q4					Q4
5.6	Station Commissioning and Training	40d	04/08/25	06/03/25									i ,			
5.7	Building/ AHJ Inspection & Training	18d	06/04/25	06/30/25									i i			
6	Bus and Infrastructure Deployment	21.5d	07/01/25	07/31/25										4		
6.1	Post-Delivery Inspection, Registration, and Insurance	1d	07/01/25	07/02/25												
6.1.1	Coordinate/Oversee Post-Delivery Inspection	1d	07/01/25	07/02/25												
6.1.2	Coordinate Vehicle Registration and Insurance	1d	07/01/25	07/02/25												
6.2	Bus Testing & Acceptance	10d	07/01/25	07/15/25										4		
6.2.1	Draft Bus & Fueling Station Acceptance Plan	5d	07/01/25	07/08/25												
6.2.2	Review/Revise Bus & Fueling Station Acceptance Plan	5d	07/09/25	07/15/25										İ		
6.2.3	Bus Commissioning & Testing	6d	07/02/25	07/11/25												
6.3	Operator, Maintenance, & First Responder Training	13.5d	07/01/25	07/21/25										ų i		
6.3.1	Review Training Plans	1d	07/01/25	07/01/25												
6.3.2	Coordinate First Responder Training with Manufacturer	5d	07/11/25	07/18/25												
6.3.3	Coordinate Operator Training with Manufacturer	5d	07/11/25	07/18/25												
6.3.4	Fleet Maintenance Plan & Training	6d	07/11/25	07/21/25										1		
6.3.4.1	Review Fleet Maintenance Plan	1d	07/11/25	07/14/25												
6.3.4.2	Coordinate Fleet Maintenance Training with Manufacturer	5d	07/14/25	07/21/25												
6.4	Fueling Station Training	5d	07/11/25	07/18/25												
6.4.1	Review Fueling Station Maintenance Plan	5d	07/11/25	07/18/25												
6.4.2	Coordinate Fueling Station Maintenance Training with Manufacturer	5d	07/11/25	07/18/25										1		
6.5	Route Validation	8d	07/21/25	07/31/25										į,		
6.6	Shadow Service Validation	8d	07/21/25	07/31/25												
6.7	- Bus Deployment	0	07/31/25	07/31/25	\											
6.7.1	Revenue Service Deployment	0	07/31/25	07/31/25	\									ė.		
7	Deployment Validation	333d	06/02/25	09/30/26											_	
7.1	Data Collection Preparation	31d	06/02/25	07/17/25										1		
7.1.1	Conduct Reporting Workshop	1d	06/02/25	06/03/25									Ļ			
7.1.2	Draft Reporting Requirements, Templates & Procedures	10d	06/03/25	06/17/25									Ĺ			
7.1.3	Review/Revise Reporting Requirements, Templates & Procedures	10d	06/17/25	07/02/25												
7.1.4	Collect Baseline Operations & Maintenance Data	10d	07/02/25	07/17/25												
7.2	Revenue Service Data Collection & Reporting	292d	07/31/25	09/30/26											_	
7.2.1	Collect/Analyze operational & Maintenance data	292d	07/31/25	09/30/26											_	
7.2.2	Issue Quarterly KPI Reports	292d	07/31/25	09/30/26											_	
8	Project Close-out	61d	10/01/26	12/31/26												
8.1	Conduct Project Close-out Workshop	5d	10/01/26	10/08/26												,
8.2	Create and Issue Final Report	50d	10/08/26	12/22/26												-
8.3	Close Project on TrAMS	6d	12/22/26	12/31/26												
9	Project Management and Reporting	1001d	01/03/23	12/31/26							+	1			+	=
9.1	Project Management & Oversight	1001d	01/03/23	12/31/26												
9.2	Project Administration	1001d	01/03/23	12/31/26												
9.3	Weekly/Monthly Status Meetings & Updates	1001d	01/03/23	12/31/26												
9.4	Quarterly Management/FTA Report	1001d	01/03/23	12/31/26				1				1				
		1													 	



Hydrogen Refueling Station via Electrolysis Low or No Emission Grant Application Trillium Response



April 15, 2022



WORK PLAN

3.1 Work Plan Narrative

Trillium has an in-house engineering, design, and construction team that exclusively work on the development of high-performing alternative fueling stations. They have a combined experience of over 100 years, with our lead engineer having over 20 years of experience on the development of clean fueling infrastructure. Over the last two decades, the team has fine-tuned their approach in designing energy and time efficient stations.

The proposed hydrogen fueling station meets the fueling performance expected by transit operations. Trillium has put forth a significant amount of effort laying out the site and sizing the station appropriately to fuel thirteen fuel cell buses. The proposed hydrogen station is made up of the electrolyzer, compressors, gas storage, dispensers, and a chiller as outlined in the section below.

Once NTP is received, Trillium will immediately begin working with Montgomery County's project team to start the 30% design package. During the 30% design package review process, Trillium will conduct any HAZOP and Hydrogen Safety Panel (HSP) reviews, procure the major equipment, and coordinate the utility upgrades that are needed for the station. Trillium has conducted HAZOPS and hydrogen safety reviews on previous hydrogen fueling station builds for other transits. In our experience, this safety review process takes approximately 8 weeks to conduct, and we've allotted the time in our preliminary schedule below.

The rest of the design process includes completion and review of the 60% and 90% design packages. Once drawings are finalized, they will be submitted for final engineering review and stamped by a Professional Engineer licensed in the State of Maryland. For a station design with newer technologies, an iterative and involved design process would take place with Montgomery County and the AHJs. This helps ease the understanding, review, and approval process of the station design.

Once the design drawings are stamped, Trillium will begin the permitting process with the appropriate AHJ. Once building permits are received from the AHJ, Trillium will coordinate with our general contractor to mobilize personnel and begin station construction.

After the construction and installation phases are complete, our team conducts rigorous quality and performance tests to ensure the fueling station will continue to run at the peak efficiency.

Once the station is operational, Trillium offers a range of customized alternative fueling station preventative maintenance packages for all clients including our Turnkey Partnership, an all-inclusive extended warranty including scheduled maintenance, emergency call outs, consumables, parts, and reporting.



3.2 Work Plan Details

Design Quality

Trillium's design and engineering team will provide the design package for Montgomery County's hydrogen fueling station. The Trillium team will hold regular internal design review meetings as well as design review meetings with Montgomery County's project team.

The design review meetings will include the Project Manager, Project Engineer, Construction Project Manager, Regional Operations Manager, the General Manager of the Design Build Services, and the Manager of Construction. We believe that each member of the team brings a different perspective and expertise. This same team will also participate in the HSP and HAZOP reviews.

Incorporation of Design Comments

Trillium will incorporate frequent review meetings with Montgomery County during the design phase. Regular meetings are essential to discuss the technical specifications and drawings to make sure Trillium and Montgomery County are aligned on the project requirements and expectations. There will be several design reviews with Trillium's engineers, project managers and Montgomery County staff, where continued dialogue and comments can be shared to improve the overall design. Any comments and feedback from AHJ will also be reviewed with the customer before the construction drawing set is finalized.

Procurement and Construction Quality

Procurement of the equipment for this project will be managed by the Project Manager, Project Engineer, and the General Manager of Design Build Services. The General Manager of Design Build Services, Carson Hoyt, and the engineering team, will have regular meetings with the equipment manufacturers to ensure a quality and safe procurement.

During the construction phase of the project, the Construction Project Manager (CPM) will lead daily field meetings alongside our subcontractors. During these meetings he will discuss the quality of the work that has been completed and share quality expectations with the team. Any deficiencies identified in daily inspections will be noted and rectified to Trillium's quality standards.

As stated previously, the CPM will generate a weekly report that tracks construction progress and quality through pictures and a narrative. The General Manager of Design Build Services will review these reports on a weekly basis. Carson and the assigned project engineer will regularly travel to Trillium fueling station construction sites across the country to ensure Trillium quality policies are being adhered to and customer expectations are being met.

Budget and Schedule Control

Trillium's Project Manager will hold regular meetings with Montgomery County to discuss the project status. During these meetings Trillium will review the project schedule along with several other project related items. To maintain the schedule, the Project Manager makes it a point to get people involved as early as possible. For instance, the permitting review process typically takes a significant amount of time. To shorten this time, the Project Manager will get the required AHJ's involved early in the design process. The Project Manager will continuously look for such opportunities to maintain and, in some cases, reduce the schedule.

Budget control is key. Trillium has internal tools to monitor project costs. The Project Manager completes a weekly report that gets reviewed by the highest levels of management. These weekly reports flag items early so that costs can be managed before they become an issue. The Project Manager will also hold regular meetings with all equipment providers and Trillium's design team. This ensures that the drawings are



aligned with the way the equipment is being manufactured. In our experience, we've found that not doing this results in cost creep.

3.3 Potential Challenges

POTENTIAL CHALLENGES	PROPOSED MITIGATION MEASURES
Code Compliance	 Meetings with jurisdictional authorities early in the process and keeping them up to date on the project as it progresses.
Inclement Weather	 We review the schedule against seasonal expectations and build in contingency days and plans to keep the project moving forward during inclement weather.
Utility Coordination	 Coordination meetings early in the process to clearly define power needs of the proposed system. This is critical for medium voltage power required by the electrolyzer.
Equipment Manufacturing and Procurement	 Equipment orders will be placed soon after NTP to avoid delivery delays. This is even more crucial today, where supply chain constraints are affecting every industry across the globe.
Disruption to Site Operations	 Proactive planning and approval with management and facility supervisors.
Facility Personnel Safety	 Use of barricades and warning devices Proper training and lockout/tagout procedures Regular safety meetings with construction teams Regular safety inspections by Trillium management to ensure policies are being adhered to.



OPERATIONS & MAINTENANCE

4.1 O&M Overview

Concept of Operations – Operations & Maintenance Phase

Once the station is operational, it can be maintained by Trillium's operations team. In fact, the same Trillium mechanics that operate and maintain Montgomery County's CNG stations will maintain the hydrogen fueling station. Montgomery County would have the advantage of working with a contractor that is deeply familiar with their current operations and expectations.

As the current service provider at Montgomery County's CNG station, Trillium understands your maintenance requirements. We will continue to meet these needs by 1) performing maintenance management, 2) monitoring of performance metrics and 3) reporting through Trillium's maintenance tracking system. Our local staff will deliver this approach supported by our dedicated support team.





24/7 Remote Monitoring



Reporting

Key elements of Trillium's Hydrogen O&M program include:

- Preventative maintenance and callout service for unscheduled maintenance
- All labor, tools, parts, materials, components, test equipment. consumables required for service (except for damage caused by the transit)
- Smart controls with 24/7 remote monitoring, fault notification and reset
- Emergency Shutdown System
- 24/7 real-time access to station performance via customer portalCoordination of maintenance activities
- Prompt response times
- Site debris and waste disposal per applicable regulation
- Annual station safety condition and assessment
- Annual hydrogen safety, fueling, and station operations training for Montgomery County personnel and designated First Responders, which will include a Training Plan with syllabus and training/safety manual
- Bi-annual one-hour safety webinars for new Montgomery County employees throughout maintenance period



4.2 O&M Details

Qualified Team of Mechanics

Practices and procedures are important, but people make the difference. Trillium prides itself on having the highest customer satisfaction in the industry and much of that is due to the dedication of our team on the ground, who work with our clients each day.

Trillium invests over \$40,000 in each team member for training program completion. These programs are designed by Trillium as well as component and system manufacturers. We provide our Mechanics with the tools they need to succeed in their jobs, such as specialty tools for equipment repairs, tablets and computers for reporting work activities, and company vehicles that are stocked with critical spare parts and tools.

Trillium mechanics stay current on new technologies through regular training meetings and discussions of maintenance issues on regular team conference calls. They are engaged in continuing education as their skills evolve with technology improvements and they are certified by our major component suppliers. In fact, Trillium is training their current mechanics on newer fuels, such as hydrogen, so they can be well equipped to maintain Montgomery County's electrolyzer station.

24/7 Monitoring and Support

Trillium's network of stations is monitored and supported by our 24/7 service coordinator team. The team is based in Houston and is staffed by highly trained personnel that visually monitor Trillium stations, personally answer calls to the service line, promptly respond to equipment faults, and communicate with service teams to resolve issues.

Trillium's service center boasts impressive availability and responsiveness. The team answers 94 percent of calls in less than 60 seconds, with an average answer time of 15 seconds.

Trillium's swift response times mean that Montgomery County can reach a trained person in less than one minute in case of any station issue. This supports our pledge to maintain safe and reliable fueling performance at these fueling stations.

Any request for service, whether it is an emergency request or normal repairs can be made at any time of day by calling Trillium's Toll-Free number (800.920.1166). All requests are tracked and forwarded to the necessary service personnel. Signs identifying Trillium as the proper party to contact, with our Toll-Free number, will be located conspicuously around the fueling area, on dispensers, and in the equipment area behind the wall.

After the 24/7 team learns of an issue from the control system or a customer call, they can contact the local mechanics to respond on-site if needed. Local staff and on-site spare parts allow us to respond promptly and resolve unforeseen maintenance issues. The dispatch team uses a smart mapping software to locate and dispatch the nearest available mechanic.

Maintenance Management System

The implementation of a custom maintenance management program allows Trillium to continue to be an industry leader in station operations and maintenance. This software warehouses all mechanic work tickets, tracks the location of our O&M team using GPS and promotes transparency with customers and throughout the entire operations department. The system has the capability to log, track and proactively monitor all station repairs and maintenance activities to ensure our clients always receive the best service possible.





The ability to create a trouble ticket and link it to the client account history is a key feature of Trillium's pledge to continue service improvements. Incident reports are manually entered into the system to create a case, a detailed snapshot of an issue or repair request. The case includes a description of the issue, client contact information and notes. The case can be assigned to a mechanic and is time stamped to track response time. A reoccurring case is used for work to be performed at future time intervals.

Maintenance requests are addressed fully before they are closed. Each case has a specified task list that is a checklist of items that must be completed before the trouble ticket is finished by the mechanic. Each case includes a notes field that allows the mechanic to document all work and an attachment field for the mechanic to upload site photos or other documents.

Closely monitoring all active customer trouble tickets is an important part of Trillium's dedication to customer service. It is this transparency, documentation and database that make the Trillium maintenance management system an integral part of customer service.



PROJECT DESCRIPTION

5.1 Station Description

The proposed electrolyzer station for Montgomery County will include the equipment listed below. It features a 1MW electrolyzer capable of producing 431 kg per day. The electrolyzer will discharge hydrogen at 30 bar (441 psi) and this would require a significant amount of compression to fuel buses at 350 bar (5,145 psi). Our proposal includes three compressors for the inherent redundancy. These compressors will take the 30 bar hydrogen gas from the electrolyzer and compress it up to 450 bar (6,615 psi), which will be stored on site within the twenty-seven high pressure storage vessels. The refueling system, which comprises of the valve panel, chiller, and dispenser, will utilize the storage vessels in a cascade fashion to achieve 10 min fills for each bus. The dispensers will be equipped with a TK16 high flow nozzle and IrDA communication capability to maximize the SOC of the hydrogen storage system on the buses. The dispensing system will comply with SAE J2601-2 fueling protocol and SAE J2799 vehicle to dispenser communications.

Trillium understands transit operations and therefore, we know the importance of resiliency and redundancy for Montgomery County to meet rollout every single day. Therefore, you will notice we have sized the station with multiple compressors instead of relying on one larger compressor. We've also included a second dispenser and a backup generator for increased redundancy. Please note, the generator is only sized for equipment downstream of the electrolyzer. In the event of electrolyzer failure, Trillium can connect Montgomery County with a hydrogen supplier from our existing relationships. Trillium will design the station so that a 3rd party hydrogen trailer connection can be seamless. A Trillium Mechanic would assist Montgomery County with connecting the trailer to a stanchion, which would tie-in to the valve panel to route gas appropriately as the pressure drops in the trailer.

Equipment& Support:

- One (1) 1 MW Electrolyzer
- Three (3) H2 Gas Compressors
- Two (2) 350 bar transit dispensers
- Precooling system, which includes the chiller and the coolant
- Twenty-seven (27) 500 bar storage vessels
- Balance of Plant, which includes the following:
 - Water purification system, electrolyzer cooling, hydrogen cooling, hydrogen purification system, control panels, and power distribution for the electrolyzer and compressors
- Station smart control system
- Safety systems fire/H2 leak detection system
- 12kV Switchgear with an ATS
- 300kW backup diesel generator
- Instrument air & nitrogen
- Project Management, Programming, Commissioning/Testing, HSP Review, and Training included.



- Civil, Mechanical, and Electrical Construction included.
- Freight included.

Project Clarifications:

- Assumes power is provided by others and within 50ft of the Equipment Area
- Assumes natural soils have a bearing capacity of 2,000psf and are not contaminated
- Assumes there are no underground obstructions, such as utilities or rock
- Assumes there are no environmental issues, such as a flood zone
- Assumes Montgomery Transit is exempt from sales tax
- Assumes Montgomery Transit to clear the area where the proposed hydrogen station is to be installed

Exclusions:

- Sales Tax
- Design and installation of utilities (electrical transformer)
- Civil engineering for the site, which includes geotechnical survey, civil survey, and excessive soil stabilization.
- Design and installation for stormwater drainage, site pavement, site lighting, and driveways.

Budgetary Pricing:

- Design, Engineering and Programming \$380,773
- Project Management and Commissioning \$336,216
- Equipment and Freight \$7,613,961
- Construction \$1,654,689
- Total (Budgetary) 9,985,639





DATE	REVISION	INITIAL
3/18/22		
0/ 10/22	PERLIMNARY	BT

ADDRESS:

6624 CRABBS BRANCH WAY REDLAND, MD 20855

DRAWN BY:

DRAWN DATE: 04/14/2022

CHECKED BY: C.HOYT
CHECKED DATE: 04/15/2022

PROJECT NAME:

MD REDLAND MONTOGOMERY HYDROGEN STATION

SITE LAYOUT ELECTROLYZER HYDROGEN STATION

