

REPORT AND
RECOMMENDATIONS ON

CONVERSION OF KCMO AND KCATA VEHICLE FLEETS TO ALTERNATIVE FUELS



UMKC SELECTED PROJECTS IN LAW,
TECHNOLOGY, & PUBLIC POLICY (Spring 2024)
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Table of Contents

Table of Contents	2
PREFACE	4
A. Scope and Organization of this Report.....	5
B. Project Team and Mentors	5
C. Sources of Information	6
II. Alternative Fuel Vehicles	6
A. Threshold Observations Regarding Alternative Fuels.....	7
B. Overall Comparison of Alternative Fuel Types	8
1. Required Infrastructure Investment.....	8
2. Cost of Fueling Vehicles	9
3. Fueling Time for Vehicles	11
4. Environmental Benefit.....	11
5. Ability of Vehicles to Handle Extreme Temperatures	12
6. Summary Chart	13
C. Comparison of Alternative Fuel Types by Vehicle Class	13
1. Class 1-2a Vehicles.....	14
2. Buses	16
3. Summary Chart	18
III. Workforce Development	18
A. Present Workforce Development Strategy.....	18
1. Needs Identified.....	18
2. Change Management	19
3. Change is a Process.....	19
4. Organizational Change Requires Individual Change.....	21
a. Pilot Stage	21
b. Iteration Stage	23
c. Release	24
d. Maintenance	25
e. Retirement	26
B. Future Workforce Development Strategy.....	26
1. Talent Development.....	26

2.	Reconsider Benefits.....	27
a.	Cooperation	29
b.	Collaboration	29
c.	Creation	30
IV.	Funding	32
A.	Information Re: Selected Federal Programs.....	32
1.	Recent DOT Funding Awards Activity	32
2.	Assistance Re: Buses and Bus Facilities.....	34
3.	Environmental Protection Agency Grant Programs.....	36
B.	State of Missouri Developments.....	37
V.	Community Engagement.....	37
A.	What is Equitable Engagement?	37
B.	Who Are We Engaging?.....	39
1.	Greater KC Metro.....	39
2.	KC Core.....	39
	Transportation Differences	40
1.	Demographics	40
2.	Communication Practices	41
C.	Community Engagement Steps.....	42
VI.	Safety.....	43
A.	Operator.....	43
B.	End User.....	45
VII.	Recommendations and Next Steps	45
A.	Summary of Some Specific Recommendations.....	45
1.	Alternative Fuel Vehicles (Primarily based on Section II above):	45
2.	Workforce Development (Primarily based on Section III above)	46
3.	Funding (Primarily based on Section IV above).....	46
4.	Community Engagement (Primarily based on Section V above).....	47
5.	Safety (Primarily based on Section VI above).....	47
B.	Potential Future Actions	47
1.	Explore Potential Partnerships.....	47
2.	Investigate Additional Alternative Fuel Sources to Consider	48
3.	Charging Infrastructure	48
4.	Quick Reference Guide.....	48

PREFACE

This Report and Recommendations document (this “Report”) has been produced as a Spring Semester 2024 student team project in the interdisciplinary Selected Projects in Law, Technology & Public Policy (“LT&PP”) course at the University of Missouri-Kansas City (“UMKC”). It builds on the Report and Recommendations on City of Kansas City, Missouri Municipal Fleet Electrification produced by a student team in the Fall Semester 2023 offering of the LT&PP course.¹ The Fall 2023 LT&PP Team Report focused on electric vehicles (“EVs”) and their utilization and adoption in the City of Kansas City, Missouri (hereinafter sometimes referred to as “City” or “KCMO”) municipal fleet of vehicles.

This Report expands on the research, analysis, and recommendations in the Fall 2023 LT&PP Team Report by expanding the scope of inquiry to include both the KCMO vehicles fleet and the fleet of buses operated by the Kansas City Area Transportation Authority (“KCATA”) and providing research and analysis of (i) different renewable fuel sources outside of electric vehicles, including hydrogen and compressed natural gas; (ii) workforce development challenges and opportunities associated conversion to alternate fuel systems; (iii) community engagement considerations; and (iv) safety considerations.

We learned this semester that the needs associated with several categories of vehicles within the KCMO fleet differ significantly from those of the KCATA’s fleet of buses. At the same time, we also learned that there are significant commonalities shared by the City and the KCATA in their approaches to exploring various alternative fuel systems technologies that are still evolving and to associated matters addressed herein. Accordingly, this Report examines both the differences and shared interests and offers recommendations we hope will be useful to planners of conversions of both fleets.

¹ Meredith Morrison (second year Law/J.D. student), Janell Sjue (Master of Public Administration student), and Matthew Walker (second year Law /J.D. student), Report and Recommendations on Kansas City, Missouri Municipal Fleet Electrification, UMKC Selected Projects in Law, Technology & Public Policy course Fall Semester 2023 (on file with authors, and sometimes hereinafter referred to as “Fall 2023 LT&PP Team Report”).

I. INTRODUCTION

A. Scope and Organization of this Report

The increasing urgency to address climate change and reduce carbon emissions has compelled cities across the globe to reevaluate their transportation infrastructure. As noted in the Fall 2023 LT&PP Team Report, KCMO has recognized that urgency in City Council Resolution 200005 adopted in 2021 and in the City’s September 2022 Climate Protection and Resiliency Plan adopted in 2022, and the City Manager has emphasized the need to reduce greenhouse gas emissions from KCMO’s vehicles fleet.²

This Report delves into the feasibility and implications of transitioning KCMO’s municipal fleet of various types of vehicles and the KCATA’s fleet of buses to alternative fuel sources. Following the foundation laid in the Fall 2023 LT&PP Team Report, this Report expands the analysis to encompass hydrogen fuel cell vehicles and compressed natural gas (“CNG”), providing a comparative discussion of their respective benefits, challenges, and infrastructure requirements.

This Report offers a detailed analysis of various vehicle classes, comparing the advantages and limitations of each alternative fuel type on various performance and cost dimensions, and also addresses workforce implications, organizational change management, and the critical role of community engagement in connection with transitioning the subject fleets to sustainable alternative fuel options. By offering observations, analysis, and recommendations regarding both the technical and human elements of such transition, our LT&PP course team aims to provide KCMO and the KCATA with potentially actionable information and insights and to help inform future policy and implementation strategies.

B. Project Team and Mentors

The “Project Team” that authored this Report consists of Lukas Fields (third year Law/J.D. student), Tiana Mohr (Master of Public Administration student), and Alaine Tate (second year Law/J.D. student). Our lead mentor on this project was LT&PP course co-instructor Professor Anthony Luppino. Other Project Team volunteer mentors included were Al Winder, Al Winder (founder and CEO of the consulting firm, Winder & Associates; former Manager of Minority Business and Equal Opportunity for the Kansas City Area Transportation Authority; and former workforce development manager for the Saudi Arabia Public Transportation Corporations System throughout the Middle East) and Mike Hughes (consultant, community

² See Fall 2023 LT&PP Team Report at footnotes 5 and 6 and accompanying text and Appendix A.

activist, and former employee of the City of Kansas City, M), formerly a staff member in the KCMO City Manager's Office, who together brought to the Project expertise and experience with transportation, economic development, workforce development, and public administration.

C. Sources of Information

This Report reflects research by our Project Team from a wide range of available written materials, input from the above-name mentors, and information gathered through interviews, meetings, or other communications with the following individuals with relevant knowledge and experiences:

- **Ray Ansari**, Founder & CEO, Future Proof, LLC
- **Cindy Baker**, Vice President of Communication, KCATA
- **Josh Berbaum**, Maintenance & Facilities Director, Champaign-Urbana Mass Transit District
- **Shannon Bruggemann**, Vice President for Education, Ranken Technical College
- **Blakeley Butler**, Fleet Asset Manager/Fleet Services Division of General Services Dept., KCMO
- **Karl Gnad**, Managing Director, Champaign-Urbana Mass Transit District
- **Gustavo Gonzalez**, Sales Manager, BayoTech, Inc.
- **Robert Kasse**, Engineering Consultant, Center for Transportation and the Environment
- **Tyler Means**, Chief Mobility & Strategy Officer, KCATA
- **Brittany Meeker**, Executive Assistant, Champaign-Urbana Mass Transit District
- **Peter Sickle**, Senior Registered Engineer/Public Works, KCMO
- **Dave Thornton**, Assistant Facilities Director, Champaign-Urbana Mass Transit District
- **Declan Vargas**, Business Development Representative, BayoTech, Inc.
- **Daniel Williams**, Fleet Administrator/Fleet Services Division of General Services Dept., KCMO
- **William Yord**, Senior Project Manager, KCATA

II. Alternative Fuel Vehicles

The Fall 2023 LT&PP Team Report focused on the utilization of electric vehicles (EVs) as a method of transitioning Kansas City's fleet of vehicles toward an environmentally friendly solution. That report first laid out generally what it would look like for a city to incorporate EVs into their fleet of vehicles, including information regarding charging, the kinds of batteries utilized in EVs, telematics, costs compared to internal combustion engine ("ICE") vehicles that are currently utilized in KCMO's fleet of vehicles, and service and management of an EV fleet. It also noted that near the end of the Fall 2023 semester

they began to gather information from KCATA about its ongoing study of hydrogen fuel cell (“HFC”) systems to power buses and offered some preliminary observations on that subject.

Before reviewing some of the findings in the Fall 2023 LT&PP Report and adding our Spring Semester 2024 analysis of alternative fuel systems, for context here is a breakdown on the composition of the KCMO and KCATA vehicles fleets we studied during the semester:

- KCMO’s fleet has a total of 2,300 vehicles, including:³
 - 500 Class 1-2a vehicles (including passenger cars, SUVs, and light pickup trucks);
 - 750 Class 2b-3 vehicles (principally heavy F250’s and 350’s, varying upfits);
 - 100 Class 4-5 vehicles (F450-550, varying upfits);
 - 40 Class 6-7 vehicles (wide variance, mostly business class Freightliner or International);
 - 360 Class 8-8+ vehicles (broadest variance and specialty upfit); and
 - 550 off-road vehicles (variety of vehicles that serve a designated purpose such as digging, trenching, material handling, etc.).

- KCATA fleet of buses totals 238, including:⁴
 - 118 fueled by CNG
 - 111 diesel
 - 4 hybrids
 - 5 EVs.

A. Threshold Observations Regarding Alternative Fuels

Particularly important for purposes of this Report is the Fall 2023 LT&PP Team Report’s discussion of “EV Fit,” which refers to how well an EV fits into a desired task that a fleet of vehicles would have to perform. The Report indicated that EVs have a better fit for Class 1-2a vehicles within the City’s fleet, as the market for EVs in those classes of vehicles are more robust than the remaining classes of vehicles, especially passenger buses.⁵ In exploring the KCATA’s needs, we learned that there are a very limited number of available EV passenger buses that qualify for the “Buy America” program, which is vital

³ Per information provided by Daniel Williams (of KCMO).

⁴ Per information supplied by William Yord (of KCATA).

⁵ See total and general description in Fall 2023 LT&PP Team Report at 3-4.

federal funding available for vehicle purchases, provided that they are produced in the United States.⁶

One potential solution that the Fall 2023 LT&PP Team proposed for further study after being introduced to key specifics of this topic by William Yord of the KCATA was the possibility of utilizing HFC buses following the lead of organizations like the Champaign-Urbana Mass Transit District (MTD).⁷ Generally, a HFC bus is fueled by hydrogen gas which enters into a fuel cell that removes electrons from the hydrogen and combines the hydrogen with oxygen.⁸ The electrons are then utilized to power an onboard battery and ultimately the bus, and the only waste produced by this process is steam which emits from the bus.⁹ It is important to not only focus on alternative fuel types for KCATA buses, but also for various classes of vehicles in the City's fleet, including large and heavy-duty vehicles that are a part of the City's fleet as well. Therefore, this Section of our Report will first compare different alternative fuels for vehicles, focusing on EVs, HFC vehicles, and vehicles utilizing CNG to provide an objective analysis of potential benefits and costs of utilizing each of those fuel systems; and then compare commercially available vehicles utilizing each of these fuel types, categorized by vehicle class, based upon important considerations indicated by KCMO and the KCATA.

B. Overall Comparison of Alternative Fuel Types

When determining the viability of an alternative fuel for deployment in a fleet of vehicles, there are a number of factors to consider. This Section II.B will address the following factors that have been identified as key considerations that should be weighed by the City and the KCATA when determining their choices from among alternative fuel systems: required infrastructure investment; cost of fueling vehicles; fueling time of the vehicles; environmental benefit of using the subject fuel; and ability of the vehicles to handle extreme weather conditions.

1. Required Infrastructure Investment

A key initial factor is the infrastructure investment that would be needed if the City and the KCATA were to integrate the particular fuel into the entirety of their fleets of vehicles where possible. As indicated in the previous report, if EVs are the chosen alternative fuel, there would be a need for large scale infrastructure investment for EV charging, especially if the City were to utilize "Depot Charging" which requires that the garage where the fleet

⁶ *Id.* at 14-15, and 33.

⁷ *Id.* at 45-46.

⁸ New Flyer website at <https://www.newflyer.com/site-content/uploads/2023/08/Xcelsior-CHARGE-FC.pdf>.

⁹ *Id.*

is stored be outfitted with charging capabilities.¹⁰ This is further compounded by information received from some interviewees that indicates that Kansas City's electric grid would likely need to be upgraded to be able to handle a predicted increase in EV charging.¹¹

The level of infrastructure investment that would be needed if hydrogen fuel vehicles were selected as the preferred alternative fuel depends on the number of HFC vehicles that are implemented in the fleet. At smaller scale implementations, they might not require infrastructure investment at the outset as BayoTech, Inc., a hydrogen production company located in Wentzville, Mo., sells portable trailers which would store up to 750 kg. of hydrogen gas that can be utilized to fuel the vehicles.¹² This would be sufficient to fuel a smaller number of vehicles (e.g., 10 or fewer buses), but if deployment was made at a larger scale then KCMO and/or the KCATA might need to negotiate with a hydrogen production facility like BayoTech for them to build a hydrogen production facility in Kansas City.¹³

The level of infrastructure investment needed for deployment of CNG buses is significantly less than the other two fuel options as the KCATA already has a CNG production station that enables them to fuel up to 200 buses nightly.¹⁴ Therefore, the infrastructure that currently exists might be sufficient for the KCATA to transition fully to CNG alternatives. This is especially true considering that approximately 50% of the KCATA's buses are currently CNG.¹⁵ For reasons that will be discussed below in addressing available options for other vehicle classes, it appears the City fleet of Class 1-2a vehicles cannot be meaningfully transitioned to CNG vehicles due to lack of available CNG passenger vehicles.

2. Cost of Fueling Vehicles

In terms of the costs associated with fueling, in this subsection II.B we will disregard the cost of the infrastructure investment discussed above and focus on a hypothetical world where all necessary infrastructure exists and discuss how much the fueling cost of the entire fleet would be.

¹⁰ Fall 2023 LT&PP Team Report at 29.

¹¹ From separate interviews of Ray Ansari (Future Proof, LLC) and Peter Sickle (of KCMO).

¹² From interview of Gustavo Gonzalez (of BayoTech, Inc.).

¹³ *Id.*

¹⁴ KCATA, *KCATA Opens CNG Bus Fueling Station* (Aug. 26, 2014) at https://www.kcata.org/news/kcata_opens_cng_bus_fueling_station.

¹⁵ Per information from William Yord (of KCATA).

As discussed in the Fall 2023 LT&PP Team Report, EVs have a significant benefit when it comes to cost. In fact, EVs may end up paying for themselves as the cost of fueling them is dramatically reduced compared to ICE vehicles and they have lower maintenance costs.¹⁶ Even assuming the cost for charging KCMO's fleet of vehicles were the same as the public charging rate, \$0.35 per kWh, and even though it likely wouldn't be as the KCATA has reached agreed upon charging rates with Evergy and the City may be able to do the same if it has not already done so, the cost of fueling Class 1 and 2 vehicles would be somewhere around \$0.11 per mile.¹⁷ In contrast, utilizing the same assumptions, the cost of operating an EV bus would cost \$0.81 per mile.¹⁸

Hydrogen, by comparison, is significantly more expensive. Assuming a rate of \$15/kg of hydrogen fuel, hydrogen vehicles in Class 1 and 2 would have an estimated fueling cost of \$0.23 per mile.¹⁹ Using the same price assumption, the estimated cost of fueling a HFC bus would be \$1.90 per mile²⁰—making the cost of fueling passenger vehicles and buses more than twice that of fueling EV alternatives. This comparison, based on Kansas City fueling prices, is consistent with the National Renewable Energy Laboratory (NREL) information regarding the cost of fueling EVs against Fuel Cell Electric Vehicles (FCEVs).²¹ This makes hydrogen, at least at the current time, the most expensive alternative fueling option for fleet vehicles.

CNG fueling costs for buses come in at an estimated \$0.32 per mile—thus cheaper than hydrogen fuel cell and EV systems.²² For passenger vehicles, including vehicles in the class 1-2a range, EVs are a much cheaper option when compared to HFC vehicles.

¹⁶ Peter Maloney, *Electric buses for mass transit seen as cost effective* (Oct. 17, 2019) available at <https://www.publicpower.org/periodical/article/electric-buses-mass-transit-seen-cost-effective>.

¹⁷ Evergy, *Fleet Summary* at <https://evfleets.evergy.com/output/fuelCosts>; Interview of Bill Yord; (\$0.11 per mile calculated using the public charging rate and the average capacity and range of EV Class 1 and 2 vehicles).

¹⁸ Calculated using the Gillig 40-ft. Battery Electric Bus energy usage of 2.3 kWh per mile (Alex Roman, *A Closer Look at GILLIG, Cummins Battery Electric Bus Partnership* (METRO Magazine, July 3, 2019, updated May 27, 2020) available at <https://www.gillig.com/post/a-closer-look-at-gillig-cummins-battery-electric-bus-partnership>).

¹⁹ Calculated using the capacity and range of the 2024 Toyota Mirai (*Fuel Specs* at https://www.toyota.com/mirai/2024/features/mpg_other_price/3002/3003) and the 2023 Hyundai Nexo Fuel Cell (The Car Guide at <https://www.guideautoweb.com/en/makes/hyundai/nexo/2024/specifications/preferred/>).

²⁰ Per information from William Yord (of KCATA).

²¹ NREL *Annual Technology Baseline* (2020) at <https://atb.nrel.gov/transportation/2020/comparison>.

²² Leslie Eudy and Matthew Post, *Orange County Transportation Authority Fuel Cell Electric Bus Progress Report Data Period Focus: Feb. 2020 through Jul. 2020* available on NREL website (March 2021) at <https://www.nrel.gov/docs/fy21osti/78250.pdf>.

3. Fueling Time for Vehicles

As discussed in the Fall 2023 LT&PP Team Report, a major downside of EVs is the time it takes to charge them.²³ Charging an EV at level 2 charging takes approximately 5 hours, meaning the charging for these vehicles would have to come overnight. This is important because it means practically for KCMO and the KCATA, that EVs they utilize cannot charge in the middle of the day if the battery runs out, thereby limiting the potential usefulness of EVs for longer range tasks. This is where HFC and CNG both have an upside on EVs as they both are fueled more like a regular car. A HFC vehicle is charged in somewhere between 3 to 5 minutes,²⁴ while a CNG bus can be fueled in less than 5 minutes if utilizing a fast-fill system.²⁵

4. Environmental Benefit

EV vehicles have a dramatic benefit over diesel alternatives as they have no tailpipe emissions.²⁶ They can improve air quality and decrease the carbon footprint of KCMO and KCATA vehicles directly as a transition is made towards alternative fuel vehicles. However, this is not to say they are a perfect carbon-neutral solution. The main barrier to this is that charging solutions would be dependent on Kansas City's grid which is powered by Evergy using primarily coal²⁷—although this is subject to change as Evergy has published plans to be Carbon Neutral by 2045.²⁸ Furthermore, the KCATA has an existing plan in place with Evergy to provide them with only green energy.²⁹ In a hypothetical scenario where the City could do the same and their entire fleet was devoted towards EVs, this would mean the emissions from the City's fleet would be zero. However, assuming that the City would utilize the Kansas City grid, this would make the carbon intensity score greater than that of California which is 93.75 gCO₂e/MJ, as the energy is produced in a more carbon intensive way for Kansas City.³⁰

²³ Fall 2023 LT&PP Report at 23-24.

²⁴ Drive Clean (ca.gov), *Hydrogen Fueling Overview* at <https://driveclean.ca.gov/hydrogen-fueling/#:~:text=Fueling%20is%20Easy%20and%20Fast,from%20other%20electric%20car%20types>.

²⁵ Roush Clean Tech, *Types of CNG Stations* at <https://roushcleantech.com/cng-fueling/#:~:text=Drivers%20use%20a%20dispenser%20to,for%20a%20%20GGE%20tank>.

²⁶ See discussion of proposed regulation of tailpipe emissions in Fall 2023 LT&PP Team Report at 10-11.

²⁷ Evergy, *Our Energy Mix* at <https://www.evergy.com/smart-energy/renewable-resources-link/our-energy-mix/#:~:text=Coal%20%2D%20Coal%2Dfired%20plants%20generate%20the%20majority%20of%20our%20electricity>.

²⁸ *Id.*

²⁹ Per information from William Yord (of KCATA).

³⁰ California Air Resources Board, *CA-GREET 3.0 Look-Up Tables Pathway—Technical Support Documentation* (Aug. 13, 2018) at lut-doc.pdf (ca.gov); U.S. Energy Information Administration, *Environment: Energy-Related CO₂ Emission Data Tables* (Data for: 2021; Release Date: July 12, 2023) at <https://www.eia.gov/environment/emissions/state/>.

HFC vehicles are somewhat similar in environmental impact as they have no tailpipe emissions other than water vapor. If the City and the KCATA were to use BayoTech for hydrogen production, their Wentzville facility utilizes a patented Steam Methane Reformation process for producing hydrogen fuel that has an estimated carbon intensity score of 110 gCO₂e/MJ.³¹ On the other hand, if the City and the KCATA were to negotiate for BayoTech or another organization to build a production facility in Kansas City, they could have this new facility use Renewable Natural Gas as a fuel for hydrogen production in some capacity which could reduce the carbon intensity score to 0 gCO₂e/MJ or -300 gCO₂e/MJ.³² However, utilizing these processes for hydrogen production at the new plant would also simultaneously increase the price of the hydrogen produced from \$4-\$6 per kg. depending on the desired carbon intensity, thereby, compounding the main argument against hydrogen fuel utilization as costs would increase greater than they already are.³³

Environmental impact is the main reason that CNG vehicles are not considered a viable alternative to achieve KCMO's plan for carbon neutrality as they do have tailpipe emissions. There is an environmental benefit of CNG as compared to diesel vehicles because the tailpipe emissions are reduced by 25% for CO₂, 90%-97% for CO, and 35%-60% for N₂O.³⁴ However, as it has been indicated in the KCMO's plan for carbon neutrality by 2040 and in various interviews conducted throughout the semester, the ultimate goal is zero carbon emissions for fleet vehicles, which CNG vehicles in their current form will never attain.

5. Ability of Vehicles to Handle Extreme Temperatures

As Kansas City's weather fluctuates to extreme temperatures commonly, it is important for fleet vehicles to be able to perform in this environment. This is a major problem for EVs as they lose 37.8% of their range when the temperature drops from 50-60°F to 22-32°F.³⁵ HFC vehicles, by comparison, lose only 23.1% of their range under the same temperature decrease, making them a more viable alternative than EVs when considering extreme weather.³⁶ However, both of these fuel types pale in comparison to established

³¹ BayoTech slide presentation; Interview of Gustavo Gonzalez (of BayoTech, Inc.).

³² *Id.*

³³ Interview of Gustavo Gonzalez (of BayoTech, Inc.).

³⁴ DTE, *Compressed Natural Gas Vehicles* at <https://www.dteenergy.com/us/en/business/service-request/natural-gas/natural-gas-vehicles.html#:~:text=Natural%20gas%20is%20an%20ideal,gasoline%20or%20diesel%2Dpowered%20equivalent>.

³⁵ Mark Henning, Andrew R. Thomas, and Alison Smyth, *An Analysis of the Association between Ambient Temperature, Fuel Economy, and Vehicle Range for Battery, Electric and Fuel Cell Electric Buses* (Cleveland State University available at <https://img.fuelcellworks.com/wp-content/uploads/2020/01/An-Analysis-of-the-Association-between-Changes-in-Ambient-Tempera.pdf>).

³⁶ *Id.*

fuel types like CNG which do not lose any range from temperature changes.³⁷ This makes CNG vehicles currently the best alternative when considering extreme weather, while HFC vehicles have benefits over EVs in this category.

6. Summary Chart

Below is a summary chart depicting the comparison of the factors considered above. This chart is based on the comparison of the different fuel types if they were to be mass implemented into the City and the KCATA’s fleet of vehicles, using color symbols to indicate how each fuel fares compared to the other two fuel types—with green connoting superior, red inferior, and yellow neutral.

	Overall Fuel Comparison		
	Hydrogen	Electricity	Compressed Natural Gas
Infrastructure Development	Red	Yellow	Green
Cost of Fuel	Red	Green	Yellow
Environmental Benefit	Green	Green	Red
Fueling Time	Green	Red	Green
Ability to Handle Extreme Weather	Yellow	Red	Green

C. Comparison of Alternative Fuel Types by Vehicle Class

As indicated in the Fall 2023 LT&PP Team Report and above in this Report, KCMO’s fleet comprises approximately 2300 motorized units. As the composition of that City fleet includes various categories and sizes of vehicles that vary in the purposes they serve and requisite necessary functionalities, it is important to know the strengths and weaknesses of the alternative fuel vehicles in each of the vehicle classes before integrating them into the fleet. However, our research indicates there to be no viable alternatives for alternative fuel vehicles for any of the Class 2b and above in the KCMO fleet; so this Section II.C will compare commercially available alternative fuel vehicles by vehicle type in Class 1 and 2a vehicles in the City’s fleet, consisting of passenger cars, SUVs, and light pickup trucks.³⁸ It will also compare buses utilizing the alternative fuels mentioned above for

³⁷ ebi, *An assessment of compressed natural gas vehicle performance in winter* (June 11, 2020) at <https://ebigaznaturel.com/en/an-assessment-of-compressed-natural-gas-vehicle-performance-in-winter/>.

³⁸ Based on information from Daniel Williams (of KCMO).

purposes of integration into the KCATA's fleet of buses. In both contexts, the vehicles in question will be compared objectively on the basis of factors that have been indicated as important for consideration including range, vehicle cost, availability of the vehicles, mechanical requirements of that class of vehicle, and weight.

1. Class 1-2a Vehicles

For Class 1-2a vehicles, this Report utilizes a representative sedan, crossover, SUV, and pickup truck that utilize each of the different fuel types. For EVs, the representative vehicles are the 2023 Chevrolet Bolt EV³⁹, the 2024 Ford Mach-E GT⁴⁰ AWD, the 2024 Chevrolet Blazer EV,⁴¹ and the 2024 Ford Lightning.⁴² Since all of these vehicles are made in the United States, they all meet the Buy America requirements. For HFC vehicles, the representative vehicles are the 2024 Toyota Mirai XLE⁴³ and the 2023 Hyundai Nexo Fuel Cell⁴⁴ which represent the sedan and crossover categories respectively. While there are no currently commercially available SUVs or pickup trucks that utilize HFC as a fueling system, there is the upcoming 2025 Honda CR-V e:FCEV which is an SUV and there has also been announced the Toyota Hilux which will be a pickup truck.⁴⁵ As these vehicles are not made by American manufacturers, it is questionable whether they will meet the Buy America requirements and it would need to be determined where the vehicles were assembled. For CNG vehicles, there have been no Class 1 or 2 vehicles manufactured since Honda stopped manufacturing them in 2015.⁴⁶ All subsequent technical comparisons of vehicles will be made in reference to vehicle specifications cited herein.

This naturally brings us to the availability factor, on which both HFC vehicles and CNG vehicles pale in comparison to the availability of EV Class 1-2a vehicles. Although HFC vehicles exist in these classes and are going to be developed more in the future, there

³⁹ Chevrolet Pressroom, *CHEVROLET BOLT EV – 2023* at <https://media.chevrolet.com/media/us/en/chevrolet/vehicles/bolt-ev/2023.tab1.html>.

⁴⁰ Ford, *2024 Mustang Mach-E® GT* at <https://www.ford.com/suvs/mach-e/models/mach-e-gt/>.

⁴¹ Edmunds, *2024 Chevrolet Blazer EV – Specs & Features* at <https://www.edmunds.com/chevrolet/blazer-ev/2024/features-specs/>.

⁴² Ford, *2024 F-150 Lightning® XLT* at <https://www.ford.com/trucks/f150/f150-lightning/models/f150-xlt/>.

⁴³ Toyota, *2024 MIRAI Full Specs* at https://www.toyota.com/mirai/2024/features/mpg_other_price/3002/3003.

⁴⁴ The Car Guide, *2024 Hyundai Nexo* at <https://www.guideautoweb.com/en/makes/hyundai/nexo/2024/specifications/preferred/>.

⁴⁵ Andrew J, Hawkins, *Honda doubles down on hydrogen with new fuel cell -powered SUV*, (The Verge, Feb. 27, 2024) at <https://www.theverge.com/2024/2/27/24084163/honda-crv-efcev-hydrogen-fuel-cell-suv-specs-gm>; Toyota UK Media Site, *Toyota reveals British-built, hydrogen-fuelled Hilux Prototype pick-up* (Sept. 5, 2023) at <https://media.toyota.co.uk/toyota-reveals-british-built-hydrogen-fuelled-hilux-prototype-pick-up/>.

⁴⁶ Sean Tucker, *What Ever Happened to Natural Gas-Powered Cars* (Kelley Blue Book, May 5, 2023) at <https://www.kbb.com/car-advice/what-ever-happened-to-natural-gas-powered-cars/#:~:text=Honda%20produced%20a%20CNG%2Dpowered,mot%20trucks%20and%20cargo%20vans.>

has been cited difficulty in obtaining them due to less demand for the vehicles resulting from the lack of fueling infrastructure outside of California.⁴⁷ There are currently only about 15,000 HFC vehicles in Class 1-2a on the road, all of which appear to be in California due to that being the only area with hydrogen fueling infrastructure that is available to consumers⁴⁸—although the fact that more auto manufacturers are getting into the market may trend favorably for HFC vehicle availability in the future.

EVs, by contrast, have a large and growing market currently, with more and more auto manufacturers developing and selling EVs, which makes meeting the Buy America requirements easier and allows for flexibility based on the City's need. CNG vehicles on the other hand appear to show no positive trends towards more availability, and with no vehicles in this class the remainder of the discussion relating to Class 1-2a vehicles will be solely relating to HFC vehicles and EVs.

The most positive aspect of HFC vehicles is their range. With the two reference vehicles, the Mirai and the Nexo having a 402 mile and 380 mile range respectively. Both of these simply outclass the range offered by any of the reference EVs where the longest range belongs to the Blazer with 279 miles.

On the other hand, HFC vehicles are significantly more expensive than EVs. The Toyota Mirai has a base model sticker price of \$50,190 and the Hyundai Nexo a sticker price of \$60,135. In comparison, their counterpart representative vehicles in the EV category, the Chevrolet Bolt and the Ford Mach-E have base model sticker prices of \$26,500 and \$39,995 respectively. Thus, in current pricing each HFC vehicle is over \$20,000 more expensive than their counterpart in the EV department. This is a significant leg up for EVs as the total savings for utilizing these vehicles would be roughly \$7.6 million if the entirety of the City's fleet of Class 1-2a vehicles was converted one way or the other without even considering the increased fueling costs of hydrogen considered above.

In terms of mechanical requirements, it is noted that these City vehicles across all classes as a baseline require 400 horsepower and 440 lb.-ft. of torque to be practically usable for required purposes of the City's fleet.⁴⁹ The only two representative vehicles our research identified that meet these requirements are both EVs—the Chevrolet Blazer and the Ford Lightning. It is also important to note that, based upon the vehicle specifications cited herein, each of the HFC vehicles have less horsepower and torque than their counterpart EV by a rather significant margin. Therefore, in terms of mechanical requirements, for

⁴⁷ John Voelcker, *Hydrogen Fuel-Cell Vehicles: Everything You Need to Know* (Car and Driver, April 29, 2024) at <https://www.caranddriver.com/features/a41103863/hydrogen-cars-fcev/>.

⁴⁸ *Id.*

⁴⁹ Per information from Daniel Williams (of KCMO).

vehicles that will be conducting more strenuous tasks than simply traveling passengers, EVs seem to be the better option.

As discussed in Fall 2023 LT&PP Team Report, increased vehicle weight can cause more damage to roads within Kansas City.⁵⁰ However, with respect to all vehicles compared herein, there is no major distinction between the weights of the representative HFC vehicles and their counterpart EVs that is particularly notable.

2. Buses

For the KCATA's purposes, it is important to note that hydrogen fuel cell electric buses ("HFCEBs") have been deployed in city fleets in the past. As of 2020 there were 12 cities in the United States which have deployed some kind of HFCEB in public transportation, totaling 64 buses in use.⁵¹ The National Renewable Energy Laboratory ("NREL") assessed the technology readiness level ("TRL") of HFCEBs at the latter stages of demonstration/commission stages that include TRLs 6-8.⁵² For reference, conventional diesel and CNG buses that are mature technologies currently sit at a TRL 9, meaning that, while HFCEBs are still developing and optimizing, they show promise of deployment on a larger scale.⁵³ The bus that has been utilized in most cities, including Champagne-Urbana, Illinois, is the New Flyer Xcelsior Charge FC that comes in 40-foot and 60-foot models.⁵⁴ Of primary importance for the New Flyer bus is that it is eligible for the Buy America framework.⁵⁵ All comparisons made herein refer to cited specifications of each vehicle.

As both EVs and CNG buses have already been deployed in the KCATA fleet of buses to varying extents, the primary purpose of this subsection of our Report is to compare the New Flyer Xcelsior Charge to the buses that are already in use by the KCATA. Both the EV and CNG buses that are utilized by the KCATA currently are the 40 foot Gillig Low-

⁵⁰ Fall 2023 LT&PP Team Report at pages 26-27.

⁵¹ Leslie Eudy and Matthew Post, *Fuel Cell Buses in U.S. Transit Fleets: Current Status 2020* Leslie Eudy and Matthew Post (NREL) at <https://www.nrel.gov/docs/fy21osti/75583.pdf>.

⁵² *Id.*

⁵³ *Id.*

⁵⁴ Champaign-Urbana Mass Transit District, *Hydrogen Fuel Cell Bus Project: Phase 1* at <https://il-act.org/wp-content/uploads/2023/05/PP4-MTD-Hydrogen-Presentation.pdf>.

⁵⁵ New Flyer, *Our next generation, zero-emission, fuel-cell electric bus* at <https://www.newflyer.com/bus/xcelsior-charge-fc/>.

Floor model.⁵⁶ However, as specifications for the Gillig CNG bus could not be located, for comparison purposes, we will focus here on the New Flyer Xcelsior CNG bus.⁵⁷

In terms of range, the representative EV bus falls far short of both the HFCEB and CNG bus. Where the EV bus only gets an estimated 150 mile range, the HFCEB and CNG bus get 300 and 350 miles respectively. Therefore, from a range perspective, the EV is the worst option for bus routes that travel a long distance throughout the day, especially considering the EV bus cannot be refueled midday due to charging times as mentioned above.

Where the HFCEB wins in range capabilities over EVs, it loses significant points in terms of cost with the representative HFCEB bus costing \$1.2 million compared to the EV bus and CNG bus costing \$950,000 and \$580,000 respectively. With more than 200 buses in the KCATA fleet, the savings of deploying an entire EV fleet instead of HFC fleet would be more than \$70 million. This is further compounded by the increased fueling costs discussed above.

In terms of mechanical requirements, none were particularly mentioned in any discussion with the KCATA outside of dependability. In that regard, it is important to note that, according to NREL, there is no meaningful difference between the dependability of buses utilizing any of the fuel alternatives considered.⁵⁸ Regarding availability, a KCATA representative noted that supply chain issues for both the HFCEB and the EV bus, making both fall short of CNG in this category.⁵⁹

In terms of weight, there has been a special emphasis on bus weight as the increases in weight with such heavy vehicles can damage Kansas City roads significantly. On this factor, HFCEB and EV buses are both approximately equally heavier than their CNG counterpart, however, the difference is minor at around 2,000 lbs. which is only roughly a 6.67% increase in weight when compared to CNG buses. Therefore, although there is an increase in weight, it arguably should not be a heavily considered factor when

⁵⁶ Roman, *supra* note 18; Penn State LTI Bus Research and Testing Center, *Bus Testing Report on 40-Foot Low Battery Electric Bus – Gillig* available at <https://www.altoonabustest.psu.edu/bus-details.aspx?BN=2020-05>.

⁵⁷ New Flyer, *Compressed Natural Gas* at <https://www.newflyer.com/bus/xcelsior-cng/#:~:text=CNG%20provides%20an%20extended%20range%20of%20350%2D400%20miles.>

⁵⁸ Elizabeth Collins and Matthew Post, *Sunline Transit Agency Fuel Cell Electric Bus Progress Report – Data Period Focus: Jan. 2020 through Dec, 2021* (NREL July 2022) at <https://www.nrel.gov/docs/fy22osti/83559.pdf>; Leslei Eudy and Matthew Jeffers, *Foothill Transit Batter Electric Bus Demonstration Results; Second Report* (NREL June 2017) at https://afdc.energy.gov/files/u/publication/foothill_transit_beb_demo_results_2nd_rpt.pdf.

⁵⁹ Information from Tyler Means (of KCATA).

determining the alternative fuel vehicle of choice as both of the zero-emission options weigh roughly the same and not much more than currently deployed CNG buses.

3. Summary Chart

Below is a summary chart including the comparison of the factors considered above. This chart is based on the comparison of the different fuel types if they were to be mass implemented into the City and the KCATA’s fleet of vehicles, using color symbols to indicate how each fuel fares compared to the other two fuel types—again with green connoting superior, red inferior, and yellow neutral.

	Class 1/2: Passenger Vehicles		Class 4: Buses		
	Hydrogen	Electric	Hydrogen	Electric	Compressed Natural Gas
Range	Green	Red	Yellow	Red	Green
Vehicle Cost	Red	Green	Red	Yellow	Green
Availability	Yellow	Green	Yellow	Yellow	Green
Mehcanical Requirements	Red	Green	Green	Green	Green
Weight	Yellow	Yellow	Yellow	Yellow	Green

III. Workforce Development

Transitioning a fleet of vehicles to green energy involves significant changes in technology, infrastructure, and workforce skills. To ensure a smooth and successful implementation, best practices in workforce development, project management, and change management principles are in order. This Section III of our Report recommends consideration of a set of strategies to prepare the present workforce for a conversion as well as a strategy for the future workforce.

A. Present Workforce Development Strategy

1. Needs Identified

Interviews conducted by one or more members of our Project Team indicated that, at a minimum, workforce needs and training associated with conversions of KCMO and KCATA vehicle fleets to alternative fuel systems require a focus on drivers/vehicle operators, maintenance and repair technicians, and personnel managing fueling/charging

stations.⁶⁰ Given the dynamic nature of alternative fuel systems, it is crucial to have informed, carefully planned, and diligently executed strategies and programs, along with continuous performance monitoring. This Section III.A outlines approaches and recommendations for tackling these challenges effectively.

2. Change Management

There are plenty of project and change management theories swirling around numerous industries today. Traditionally, the “Project Management Body of Knowledge” (“PMBOK”) method, is one of the most used and cited methods because of its clear, structured, and predictable approach.⁶¹ However, in the workplace, it is just too long of a process, involves too much review, and provides insufficient opportunity to reinforce skills or adapt to change.⁶² A blend of two processes may be best suited for a radical change, such as a fleet conversion where numerous departments collaborate. This blend will include The Prosci ADKAR Model,⁶³ which focuses on individual change, and “Agile” project management, which is normally seen in software development.⁶⁴ The acronym “ADKAR” encapsulates the key components necessary for successful change: Awareness, Desire, Knowledge, Ability, and Reinforcement.⁶⁵

3. Change is a Process

A fleet conversion is a massive undertaking; as much time and planning goes into it by leaders and stakeholders, a proportional amount of energy must be sent to the teams within each department impacted. Leaders should not send a message that change will come in a single undertaking where the team is expected to hop on board or miss the boat.⁶⁶ Such a conversion involves a radical change that is driven by a significant opportunity to address climate change and transition toward a more sustainable and

⁶⁰ From interviews of Daniel Williams (of KCMO) and William Yord (of KCATA).

⁶¹ An explanation of the PMBOK method strengths and weaknesses can be found at <https://magnapro.ca/project-management/traditional-project-management/>.

⁶² Agile approaches simplify and improve the process of managing change by breaking the project into phases and continuous collaboration and improvement. ADKAR complements an agile approach by providing a framework for understanding the individual and collective aspects of change. A comparative analysis between PMBOK and Agile Approaches can be found at <https://guides.visual-paradigm.com/a-comparative-analysis-of-pmbok-and-agile-approaches-strengths-and-weaknesses/>.

⁶³ The three step Prosci ADKAR Model can be found at <https://www.prosci.com/methodology/3-phase-process>.

⁶⁴ An introduction to Agile Project Management can be found at <https://www.apm.org.uk/resources/find-a-resource/agile-project-management/>.

⁶⁵ *Id.*

⁶⁶ Jeffrey M. Hiatt and Timothy J. Creasey, CHANGE MANAGEMENT: THE PEOPLE SIDE OF CHANGE (2012) at 34.

resilient energy system.⁶⁷ Most fleet managers are not transitioning their entire fleet in one sweep; they are portioned by one or two vehicles at a time due to limited manufacturers and costs.⁶⁸ For example, the Kansas City Fire Department (“KCFD”) has determined that some of its vehicle types do not currently have available EV options.⁶⁹ The soft mandate for greener vehicles signals significant policy shifts in the coming years.⁷⁰ By moving to an electric vehicle fleet now, companies absorb costs gradually before regulations increase, such as one that requires only green energy vehicles to operate.⁷¹ A sudden, complete switch to electric vehicles, or other alternative fuel systems overnight is not feasible. Therefore, it is essential to consider the utilization patterns of any existing fleet and prioritize changes strategically to optimize cost efficiency and training development. A Senior Registered Engineer from KCMO’s Department of Public Works stated the first step should be to purchase readily available EVs for passenger vehicles as a starting point, learn the vehicle’s needs and what the team needs, and then move on from there.⁷² That view brings us to the ADKAR Model.

⁶⁷ Piyush Verma, “Transitioning to Renewable Energy: Three Governance Approaches That Can Drive Change,” (World Economic Forum, May 10, 2023) at <https://www.weforum.org/agenda/2023/05/transitioning-to-renewable-energy-governance-approaches/>.

⁶⁸ Most states and cities have portioned out their conversion to electric fleets. NYC phased out their conversion and as of 2021 converted 3 quarters of their fleet, find out more at <https://www.nyc.gov/assets/dcas/downloads/pdf/fleet/NYC-Clean-Fleet-Update-September-2021.pdf>. The city of Cambridge, MA has plans to phase out their conversion over the next 10 years, find out more at <https://www.cambridgema.gov/Departments/publicworks/Initiatives/Sustainability/cleanfleetinitiative>. 57 percent of Long Beach City, CA fleet is comprised of alternative fuel vehicles, with 98 percent of new purchases being alternatively fueled when available and meeting operational need, find out more at <https://www.longbeach.gov/globalassets/city-manager/media-library/documents/memos-to-the-mayor-tabbed-file-list-folders/2024/april-2--2024---annual-report-state-of-city-fleet-s-ev-transition>. A poll of over 200+ fleet decision makers in the UK in Q1 2023 revealed that cost pressures had prompted 76% of them to postpone their transition, find out more at <https://www.raconteur.net/responsible-business/fleet-managers-transition-evs>.

⁶⁹ The KCFD recognized in some instances that an electric option was unavailable for some specific vehicles or the cost was too burdensome. Read more about KCFD’s conversion of nonemergency vehicles here <https://www.kctv5.com/2024/06/06/one-year-later-kcfd-updates-progress-switch-electric-non-emergency-vehicles/>.

⁷⁰ “Soft mandating” encourages individuals to behave in a certain way without explicitly requiring it. Currently, the federal government does not require a certain number of green vehicles per automaker but instead sets pollution standards for an automaker’s vehicle fleet that would be difficult to achieve without increasing the share of electric or other low-carbon vehicles. Similarly, KCMO City Manager Brian Platt’s announcement that new municipal fleet purchases for the City must all be full battery electric vehicles where available in 2021 is a soft mandate to the electrification of the fleet since it is not a requirement to take any ICE off the road—only that new purchases are to be green. Find out more about Kansas City’s announcement here

<https://www.kcmo.gov/Home/Components/News/News/1700/16#:~:text=The%20push%20toward%20a%20healthier,battery%20electric%20vehicles%20where%20available> and the federal announcement here <https://thehill.com/policy/energy-environment/4545415-electric-vehicle-rule-epa-biden-administration-what-to-know/>.

⁷¹ Teletrac Navman, *How to Transition Electric Fleet Vehicles Using Fleet Management Software* available at <https://www.teletracnavman.com/fleet-management-software/alternative-energy/resources/how-to-transition-to-electric-fleet-vehicles-using-fleet-management-software>.

⁷² From interview of Peter Sickel (of KCMO).

4. Organizational Change Requires Individual Change

Organizational changes often fail because employees do not understand the importance of getting on board with the change or how to successfully make the change.⁷³ The ADKAR Model is a process that can be implemented into a project to ensure that individuals are kept on board a quick-moving ship. As noted above, the process includes the following five key steps:

- Awareness** of the need to change
- Desire** to participate in and support the change
- Knowledge** about how to change
- Ability** to implement new skills and behaviors
- Reinforcement** to keep the change in place

The following discussion explores the Agile life cycle and how the ADKAR Model can be used within it. Agile Project Management is a flexible approach that prioritizes collaboration and continuous improvement.⁷⁴ It enables project teams to work quickly and collaboratively on a project while being able to adapt to changing requirements in development.⁷⁵ Agile is broken up into 6 steps: Concept, Inception, Iteration, Release, Maintenance, and Retirement. In the context of converting vehicles fleets to alternative fuel systems, the subject to this Report, the following discussion combines the concept and inception stages into a “Pilot Stage”. Segmenting the vehicles will help identify which electric or other alternative fuel vehicle models could work as replacements for vehicles with the KCMO and KCATA fleets.

a. Pilot Stage

Careful planning is crucial in the Pilot Stage to ensure a smooth transition and to consider the most important processes to review. Developing an implementation plan that includes timelines, budgets, and stakeholder responsibilities can be essential. As businesses transition to alternative fuels, they should plan to leverage both ICE and alternative fuel vehicles so software that can handle both can be imperative.

To plan a transition to an alternative fuel system (e.g., from ICE to EV) effectively, there are three key data points that businesses should focus on (1) duty cycles, (2) dwell time and location, and (3) trip locations.⁷⁶ The project plan should of course outline the steps

⁷³ The Prosci ADKAR model focus on facilitating individual change, find out more at

<https://www.prosci.com/methodology/adkar>

⁷⁴The Agile Software Development Life Cycle at <https://www.wrike.com/agile-guide/agile-development-life-cycle/>.

⁷⁵ Tech Target, *Agile Project Management (APM)* at

<https://www.techtarget.com/searchcio/definition/Agile-project-management#:~:text=Agile%20project%20management%20enables%20project,each%20sprint%20and%20product%20cycle.>

⁷⁶ Teletrac Navman, *supra* note 71.

required to implement the conversion plan,⁷⁷ including considering charging infrastructure, the procurement of vehicles, the training of operators,⁷⁸ government incentives, vehicle availability and suitability, total cost of ownership, and fuel metrics.⁷⁹

An operations and maintenance plan that includes regular maintenance and inspection of the charging infrastructure and vehicles, as well as protocols for addressing malfunctions and repairing equipment are also critical elements of the overall plan.⁸⁰ In addition, the power supply and distribution infrastructure required to support conversion plans should be considered. The implementation plan should assess the capacity and reliability of the power supply to ensure that it can support the increased energy demand from electric technologies.⁸¹ It should also consider the infrastructure required to distribute power to different depot areas, including charging stations and terminals. A cadence for leader meetings should be set up to ensure cross-collaboration between the fleet departments and the energy departments, as well as a space for leaders to bounce ideas for best practices for each other so operations will be coordinated.⁸²

An introduction of the project to get the Pilot Stage group interested can simply be a heads up a few times a week or a few signs about the conversion, why it is being done, and an overview of how the rollout will affect different departments to begin the buy-in process and develop trust.⁸³ The Pilot Stage group would presumably include relevant stakeholders (facilities lead, fleet lead, and a business lead), most engaged employees, and those who are most interested in developing new knowledge and skills. Ideally, the team would include some members who will champion the change and share what they are doing to spark desire amongst the entire team when a leader is not present. Introducing the initiative to the team early on engages them, prepares them for change, and allows leaders to address questions they will have early on and throughout the process. Recurring themes among field employees, such as mechanics and vehicle

⁷⁷ Joe Petrie, *What to Consider When Creating An Airport Electrification Master Plan* (AVIATIONPROS, May 10, 2023) at <https://www.aviationpros.com/airports/article/53059924/what-to-consider-when-creating-an-airport-electrification-master-plan>. The timeline for implementing a plan will depend on many factors: the size of the fleet and whether infrastructure will be incorporated, the specific goals and scope of the plan, the urgency of implementation, as well as factors such as funding availability, regulatory requirements, and stakeholder engagement. *Id.*

⁷⁸ During interviews, William Yord (of KCATA) explained that the KCATA requests a commitment from the seller to train operators and technicians on the new technologies. Leaders of Champaign-Urbana Mass Transit Authority also explained during interviews that their maintenance technicians trained with Ballard to learn the basic level service.

⁷⁹ Teletrac Navman, *supra* note 71.

⁸⁰ *Id.*

⁸¹ Joe Petrie *supra* note 77.

⁸² Cory Barnes. *The Secret to Seamless Cross-Team Collaboration: 8 Strategies for Alignment*. Aug 23, 2023 at <https://www.linkedin.com/pulse/secret-seamless-cross-team-collaboration-8-strategies-cory-barnes>

⁸³ This is a blend between awareness and desire of the ADKAR method. Find out more at <https://www.linkedin.com/pulse/unlocking-agile-change-management-success-adkar-tanya-akin#:~:text=ADKAR%20is%20a%20model%20that%20complements%20agile%20change%20management%20by,Knowledge%2C%20Ability%2C%20and%20Reinforcement>.

operators, are: (1) the transition is happening too fast, (2) what it means for them, and (3) why Zero-Emissions Vehicles?⁸⁴

Pilot Stage: Concept + Inception	Define the project scope + priorities, introduce the initiative to the team, and build a pilot team.	Awareness + Desire
Iteration	The pilot team undergoes training + practices with initial new materials (buses + infrastructure). Leaders track progress and measure success.	Knowledge + Ability
Release	Leaders review feedback from the pilot group and then reconcile issues or concerns to roll out to the full team.	Ability + Reinforcement
Maintenance	Support and offer incentives for continuous desire. Address any challenges the full team has. Order more buses	Reinforcement
Retirement	Phase out diesel + move green vehicles into service	

b. Iteration Stage

In the Iteration Stage, champion employees would typically begin training on new content. A few different training options might be considered.

- The Pilot Stage group and a learning/training + development professional could take an accelerated course, then return to the business to create “train the trainer” courses.
- A technical school might be engaged to come onsite at fleet facilities to train the Pilot Stage group (or the entire team).
- A consortium approach might be considered: Fleet managers (City of KCMO, KCATA, KCFD, KCI), unions, dealers, and manufacturers, to do shared best practices⁸⁵

⁸⁴ Violetka Dirlea, *Strategies for transitioning internal fleets to zero-emission vehicles* (EY, Aug. 15, 2022) at https://www.ey.com/en_us/power-utilities/proven-strategies-for-transitioning-fleets-to-zero-emissions.

⁸⁵ The State of Sustainable Fleets, *Small and Medium Fleets: Transitioning to Clean Vehicle and Fuels* (April 5, 2023) at <https://www.stateofsustainablefleets.com/webinar/small-and-medium-fleets-transitioning-to-clean-vehicles-fuels/>. Leading small and medium fleets discuss their best practices and brainstorm others to overcome challenges and capture the business benefits of deploying clean vehicles and fuels. They discuss the technology adoption, up-front costs, training and education, maintenance, part availability, and innovative fueling. Kansas City fleet systems can develop a consortium that is local and more relevant. Watch here: <https://www.stateofsustainablefleets.com/webinar/small-and-medium-fleets-transitioning-to-clean-vehicles-fuels/>.

- Online courses from a national training center might be used as another possible training delivery system.⁸⁶

Leaders should track progress during this time and measure success. This evaluation will be invaluable as new/less experienced team members join the company to assess individuals' strengths and weaknesses and to empower the team's ability throughout the conversion. Three methods of effectively tracking progress and measuring success are through daily standups, sprint/collaborative reviews (the associates will demonstrate their processes, and the managers will give their feedback), and retrospective reviews (multiple departments may be considered to determine the flow of each role's contributions).⁸⁷

- Daily stand-ups after training days would be helpful for individuals to share obstacles and discuss solutions.
- The purpose of sprint reviews is for the team to receive feedback on their training, celebrate development, align the vision and identify improvements.⁸⁸ Sprint reviews biweekly or monthly could be done to help summarize how the training is going: what is working and why, what is not working and why, what are some innovative solutions, and what each department can focus on to get better.
- Lastly, Retrospectives can be used to discuss what went well, what could be improved, and bring the team together to decide on actions to be more efficient in the future.⁸⁹ Retrospectives can be scheduled, one a few days after the full training is completed, another within one to two weeks after to see whether and how different components are being utilized and what was not useful, and the last one a month later to ensure that the skills are still being used.

Those three reflections - daily standups, sprint reviews, and retrospectives, can assist in managing the change culturally.

c. Release

Training programs for the full team would presumably be rolled out based on their roles and responsibilities. Feedback from the Pilot Stage may have proved that employees only need a workshop or simulation for a few hours to over a few days before they can

⁸⁶ Alternative Fuel Vehicle Institute, *Course Catalog – various courses on alternative fuel systems* described at <https://afvi.com/course-catalog/>.

⁸⁷ The most popular agile practice are meetings that provide transparency and regular communication with the team. Find out more at <https://www.atlassian.com/agile/scrum/ceremonies>.

⁸⁸ Dan Radigan. *Agile Sprint Reviews*. (ATLASSIAN, June 17, 2024) at <https://www.atlassian.com/agile/scrum/sprint-reviews>.

⁸⁹ *How to conduct a successful sprint retrospective*. (Atlassian, June 17, 2024) at <https://www.atlassian.com/team-playbook/plays/retrospective>.

confidently move and handle the new resources.⁹⁰ There may be some concepts that require more focused training over others or even some departments that will need hands-on training from an instructor over a longer duration of time whereas another department may need only a brief overview. Adopting a process to monitor employee progress and challenges or concerns that arise is also advisable. In addition, appropriate personnel will need to ensure that the new infrastructure being installed meets safety codes and regulations for the building and the equipment.

Leaders of the conversion to alternative fuels may also want to consider collaborating with industry partners, academic institutions, and relevant organizations to access training resources, expertise, and best practices in green energy technology. Partnerships with manufacturers, suppliers, and research institutions can provide valuable insights and support for workforce development initiatives.⁹¹ Training that familiarizes the employees with the operation, maintenance, and safety considerations of the new vehicles and infrastructure is imperative to a smooth transition.

d. Maintenance

Providing ongoing support, mentorship, and coaching to employees across departments as they transition to working with new infrastructure and vehicles, and putting systems in place to monitor employee performance, gather feedback, and evaluate the effectiveness of training programs to identify areas of improvement can also be valuable elements of the plan.⁹² Offering opportunities for professional development and skills enhancement can be a positive way for the culture to support growth, long-term success, and sustainability.

Kansas City Focus

A mix of classroom and on-the-road training concurrently can help to contextualize

⁹⁰ For instance, we learned from interviewing representatives of the Champaign-Urbana Mass Transit District that they quickly realized that bus operators who had driven hybrid buses quickly adapted to driving hydrogen fuel cell (HFC) buses. Their drivers only needed a few hours to get accustomed to HFC because driving was seemingly identical between the two vehicles.

⁹¹ In an interview with leaders of the Champaign–Urbana Mass Transit District, they shared that Ballard, of Ballard Power (a leading global provider of innovative clean energy fuel cell solutions) trained their technicians over time, though it was expensive, the options were limited. It was worthwhile because the maintenance needs are relatively simple and those who are trained can handle maintenance needs at a basic level. Soon AC Transit in Oakland, CA will open a training institution, which they anticipate utilizing in the future so that the full maintenance team can handle the basic maintenance needs of clean energy vehicles. Find out more at <https://www.parsons.com/project/ac-transit-zero-emission-bus-zeb-training-facility-oakland-ca/>.

⁹² Karl Gnadt, the Managing Director of the Champaign-Urbana Mass Transit District explained in an interview that he encourages training and educating maintenance technicians on high-voltage systems due to the vehicles unique aspects and keeping staff aware while on the road. To find out more visit <https://blog.ballard.com/bus/champaign-urbana-mtd-transitioning-transit-agency-fuel-cell-buses>.

what trainees are learning.⁹³ Place experienced drivers and new drivers together (and vice versa) every few months to ensure the new hire is confident and performing up to par.⁹⁴ Using virtual learning in tandem with classroom learning is another way for non-operator positions to utilize other training formats.⁹⁵

In the case of KCATA, For either position - operator or field, consider negotiating for a union leader to train their members for a 3-hour class.

e. Retirement

Research suggests that there will probably be diesel vehicles for the next 20 years as alternative fuels/green vehicles are introduced to fleets in phases. One source has stated: “Most trucks on the roadway will probably be powered by a combination of fuels and technology, such as by hydrogen and fuel cells, or battery-electric, or even renewable natural gas or diesel fuel.”⁹⁶

B. Future Workforce Development Strategy

1. Talent Development

Fostering lifelong learning is the key to workforce development. Building a resilient workforce starts with taking care of employees and their families so they can take care of business. Employees are looking for learning opportunities because the workforce is changing, and AI is now in the arsenal.⁹⁷ So, leaders should rethink recruitment and talent development, and focus on quality, not quantity. Skillset and employee wellness must be at the top of everyone's mind.⁹⁸

⁹³ National Academies of Sciences, Engineering, and Medicine. 2023. *Bus Operator Workforce Management: Practitioner’s Guide*. Washington, DC: The National Academies Press at <https://doi.org/10.17226/26842>.

⁹⁴ Foursquare ITP, *Transit Workforce Shortage: Synthesis Report* (March 2023) at <https://www.apta.com/wp-content/uploads/APTA-Workforce-Shortage-Synthesis-Report-03.2023.pdf>.

⁹⁵ Blended learning is a form of training that uses multiple methods – both traditional in person and digital to deliver training. Emma Gaquin discusses more at <https://www.td.org/atd-blog/why-companies-are-moving-toward-blended-learning-in-the-workplace>; Romy Catauta discusses different methods of providing blended learning at <https://trainingindustry.com/articles/strategy-alignment-and-planning/blended-learning-revolutionizing-corporate-training/>; and ELM Learning discusses more best practices and other great takeaways at <https://elmllearning.com/hub/elearning/blended-learning/>.

⁹⁶ Taylor Oil Co. *20 Years Forward: The Prediction is Diesel Still on Top*. May 2021 at <https://www.tayloroilco.com/20-years-forward-the-prediction-is-diesel-still-on-top/>.

⁹⁷ Steph Brown. *AI is coming, but workforces feel unprepared* (Financial Management, June 17, 2024) at <https://www.fm-magazine.com/news/2024/jun/ai-is-coming-but-workforces-feel-unprepared.html>.

⁹⁸ See Stephanie Ferguson and Makinizi Hoover, U.S. Chamber of Commerce. *Understanding America’s Labor Shortage; The Most Impacted Industries* (May 13, 2024) at <https://www.uschamber.com/workforce/understanding-americas-labor-shortage-the-most-impacted-industries>.

Both the KCATA and the City of Kansas City could harness talent and encourage their teams to upskill and sometimes reskill to boost retention.⁹⁹ Upskilling allows employees to learn new skills on the job through peers or structured training investments. Reskilling is the acquisition of new skills entirely.¹⁰⁰ Amongst a host of other related issues, the issues of non-sufficient planning of upskilling and reskilling and retraining of workers, aging of the workforce, and the lack of development of higher technical education curricula have been identified by the European Commission (encompassing 10 European nations) to be disrupting the growth across the automotive industry globally.¹⁰¹ Across the globe, the automotive industry is facing change due to accelerated technological advances, as well as societal and cultural trends.

2. Reconsider Benefits

The transit industry faces a critical labor shortage, with 96% of agencies reporting staffing gaps and 84 percent of which said the shortage is affecting their ability to provide service, according to a 2022 American Public Transit Association (“APTA”) survey.¹⁰² A key factor in this shortage is the lack of affordable childcare, particularly impacting women’s workforce participation. The Transit Workforce Center identified innovative childcare support models as a solution:¹⁰³

- Voucher Systems: Offering financial assistance to choose existing childcare providers.
- On-Site Childcare Centers: Providing convenient access to childcare facilities directly managed by the agency, operating every shift that employees are.
- Discounted Childcare Centers with Contractors: Partnering with providers to offer employees childcare at reduced rates.

⁹⁹ John Deal. *What are Upskilling and Reskilling*. June 14, 2024 at <https://www.phenom.com/blog/what-are-upskilling-and-reskilling#:~:text=Creating%20an%20upskilling%20and%20reskilling,invested%20in%20their%20career%20development>.

¹⁰⁰ Stanford Center for Professional Development. *What is Upskilling and Reskilling?* at <https://online.stanford.edu/what-upskilling-and-reskilling#:~:text=Reskilling%20refers%20to%20the%20acquisition,demand%20or%20personal%20career%20goals>.

¹⁰¹ Publications Office of the European Union, *Blueprint for sectoral cooperation on skills*, European Commission (June 17, 2024) at <https://op.europa.eu/en/publication-detail/-/publication/ba8c64fc-27bc-11eb-9d7e-01aa75ed71a1>.

¹⁰² American Public Transportation Association *Transit Workforce Shortage* report at <https://www.apta.com/wp-content/uploads/APTA-Transit-Workforce-Shortage-Report.pdf>.

¹⁰³ See Laurel Schwartz, *Child Support in the Transit Industry: A Vital Initiative for Workforce Stability* (National Center for Mobility Management, March 21, 2024) at <https://nationalcenterformobilitymanagement.org/blog/childcare-support-in-the-transit-industry-a-vital-initiative-for-workforce-stability/>.

These programs have proven benefits. Research shows that reduced childcare costs directly increase women's workforce participation.^{104, 105} Additionally, real-world examples like the NYC Metropolitan Transit Authority's Child Care Reimbursement Fund, South Dakota Prairie Hills Transit's on-site center, and Central Ohio Transit Authority's ("COTA") childcare partnerships demonstrate the positive impact on employee morale, attendance, and ultimately, recruitment and retention within the transit sector that takes a "you support us, we support you" approach.¹⁰⁶

Pay often is not the most important reason cited by employees for being satisfied with their jobs or wanting to continue to work for a particular organization.¹⁰⁷ To retain employees who are not parents or guardians for longer than 6 months, ideal strategies include providing tuition assistance for related disciplines,¹⁰⁸ improving work environments, offering flexibility in scheduling and shift coordination, incentivizing retention through pay and shift distribution, establishing clear career pathways based on merit rather than seniority,¹⁰⁹ providing mental health resources for staff,¹¹⁰ and offering overall support for employee well-being. Fostering lifelong learning can continue this supportive work culture through cooperation, collaboration, and creation.¹¹¹

¹⁰⁴ American Progress. *The Child Care Crisis is Keeping Women Out of the Workforce*. Mar 28, 2019 at <https://www.americanprogress.org/article/child-care-crisis-keeping-women-workforce/>. See also American Progress and *Providing Affordable, Accessible, and High Quality Child Care*. Mar 24, 2024 at <https://www.americanprogress.org/article/playbook-for-the-advancement-of-women-in-the-economy/providing-affordable-accessible-and-high-quality-child-care/>.

¹⁰⁵ For Transit Workers in particular, Laurel Schwartz. *Childcare Support in the Transit Industry: A Vital Initiative for Workforce Stability*. Mar 21, 2024 at <https://nationalcenterformobilitymanagement.org/blog/childcare-support-in-the-transit-industry-a-vital-initiative-for-workforce-stability/>. The National Council of Negro Women discusses multiple transit authorities that have successfully incorporated a joint development between new infrastructure and child care services for their employees, learn more at <https://www.transit.dot.gov/sites/fta.dot.gov/files/2021-03/Childcare-at-Transit-Stations.pdf>. Lastly, the Transit Workforce Center conducted a case study that discusses several approaches to childcare support in the transit industry at https://www.transitworkforce.org/resource_library/childcare-case-study/.

¹⁰⁶ National Council of Negro Women, Inc. *Citizen's Guide to Childcare Service and Transit Stations* at <https://www.transit.dot.gov/sites/fta.dot.gov/files/2021-03/Childcare-at-Transit-Stations.pdf>.

¹⁰⁷ U.S. Office of Personnel Management. *Human Resources Flexibilities and Authorities in the Federal Government* at <https://www.opm.gov/policy-data-oversight/pay-leave/reference-materials/handbooks/humanresourcesflexibilitiesauthorities.pdf>.

¹⁰⁸ American Public Transportation Association, *supra* note 102.

¹⁰⁹ Bain & Company. *How Clear Career Paths Strengthen Retention and Diversity* at <https://www.bain.com/insights/how-clear-career-paths-strengthen-retention-and-diversity/>.

¹¹⁰ See Meghan Biro. Forbes. *Mental Health Benefits: A Workplace Must-Have* at <https://www.forbes.com/sites/meghanbiro/2023/10/09/mental-health-benefits-a-workplace-must-have/> and Upkeep. *Which 7 companies provide world-class mental health support in the workplace for maintenance workers?* at <https://upkeep.com/learning/mental-health-maintenance/>.

¹¹¹ Kristian Kuhlmann, Daniel Küpper, Marc Schmidt, Konstantin Wree, Rainer Strack, and Philipp Kolo. BCG. *Is E-mobility a Green Boost for European Automotive Jobs?* at <https://web-assets.bcg.com/82/0a/17e745504e46b5981b74fadba825/is-e-mobility-a-green-boost.pdf>.

a. Cooperation

Multi-stakeholder “Workforce Development Partnerships” can foster collaboration between government agencies, labor unions, industry think tanks, and transportation manufacturers¹¹² to identify future skill needs and develop targeted training programs.¹¹³

Kansas City Focus

Currently, the Federal Transit Authority has workforce development and training as a main initiative. The agency provides grant money for transit agencies to further their training programs. These funds can be leveraged to hire a learning and development professional that can develop course curricula to advance the workforce through reskilling and upskilling.

b. Collaboration

Consider creating numerous workforce pipelines such as an educational pathway and competency cluster to trade information. To create an educational pathway, partner with colleges,¹¹⁴ universities, trade schools,¹¹⁵ and even tech-focused high schools to create a seamless bridge between academic programs and the specific skills required in the transportation industry.¹¹⁶ Also, industry-specific competency clusters allow enterprises to collaborate with like-minded companies to create a shared curriculum that addresses industry-wide skill gaps and fosters a more prepared workforce across the sector.¹¹⁷

Fostering lifelong learning by building pipelines, skill mapping, integrating learning modules in different formats, and approaching age and experience less while increasing

¹¹² As mentioned above, the KCATA has begun this during procurement to have sellers train the team on new technology. A step further would be to find out the skills needed for new technologies to add into skill mapping of the current team and to fill skill gaps with new recruits or prepare to upskill the current team.

¹¹³ See, e.g. Electric Vehicle Training Program at Carroll Community College at <https://www.carrollcc.edu/> and <https://www.carrollcc.edu/articles/a-battery-of-opportunities-carrolls-new-electric-vehicle-training-program/#:~:text=At%20the%20forefront%20of%20new,two%20weeks%20of%20fulltime%20work>.

¹¹⁴ See Automotive Technology Courses at Johnson County Community College at <https://www.jccc.edu/academics/credit/automotive-technology/>; Automotive Technology Program at Metropolitan Community College KC at <https://mccckc.edu/programs/automotive/>; and Ranken Technical College at <https://ranken.edu/>. During an interview, Shannon Brueggemann explained Ranken Technical College’s unique model where they focus on partnering with businesses in the industry to train and prepare their students for the workforce. Opportunities like Ranken’s can be advantaged by creating a pipeline for new recruits and by using Ranken’s assessments to begin skill mapping the current team to find out the skill gaps and build curricula for learning outcomes needed.

¹¹⁵ See more information about hybrid/electric vehicle training at Savannah Tech <https://www.savannahtech.edu/hybrid-electric-vehicle-technician-starts-fall-2023/>.

¹¹⁶ The FTA National Transit Workforce Development Strategic Plan for 2023-2028 can be found at <https://www.transit.dot.gov/sites/fta.dot.gov/files/2023-08/FTA-Report-No-0251.pdf>.

¹¹⁷ James Wilson. *Supporting Skills for Industry Through Clusters*. September 2020 at https://www.clustercollaboration.eu/sites/default/files/WYSIWYG_uploads/discussion_paper_skills_final_2.pdf. See also Publications Office of the European Union, *Blueprint for sectoral cooperation on skills*, *supra* note 101.

an approach in skills and aptitude for learning more are solutions to the evolving alternative fuels for vehicles industry. Data has shown that employees prefer peer-to-peer training to classroom-based or computer programs.¹¹⁸ Focusing on the skills each position needs will assist recruiters with potential candidates who may not have the experience but do have the aptitude and the attitude to pick up the skills. Bringing these groups together - tenured and newly hired employees - will encourage a bit of curiosity and competition to pick up new skills. “On the one side, formal and traditional education (e.g. university courses) tends to focus on “new professionals”, therefore not addressing the need for up/reskilling existing workers; on the other side, rapid changes in technologies and processes require a swift adaptation of university curricula that is not always possible.”¹¹⁹

c. Creation

An organization conducting large-scale vehicles conversion should consider developing an easy-to-understand tailored training program based on unique needs identified through Learning & Development (L&D) initiatives and ongoing Research & Development (R&D) efforts. Creating a new curriculum can be a creative way to recruit candidates from new pipelines.¹²⁰ Ford¹²¹ and Audi¹²² have their own curriculum, leveraging digital technologies like virtual learning and augmented reality to train their workers. Train-the-trainer initiatives merging new and old learning methods together can eventually lead into an apprenticeship program¹²³ for the betterment of the business. With an apprenticeship, workers will receive the exact skills and knowledge needed for specific positions. Currently, it appears there are very few programs in the Kansas City area preparing

¹¹⁸ Information on peer learning can be found at <https://hilt.harvard.edu/wp-content/uploads/2019/10/HILT-2019-HANDOUT-FORMATTED-4-PP.pdf>.

¹¹⁹ Publications Office of the European Union, *Blueprint for sectoral cooperation on skills* (Sept. 30, 2020) at <https://op.europa.eu/en/publication-detail/-/publication/ba8c64fc-27bc-11eb-9d7e-01aa75ed71a1/language-en>.

¹²⁰ Parsons Corporation, *AC Transit Zero Emission Bus (ZEB) Training Facility-Oakland, CA* at <https://www.parsons.com/project/ac-transit-zero-emission-bus-zeb-training-facility-oakland-ca/>. During an interview with Brittany Meeker, she explained Champagne-Urbana Mass Transit District has plans to send their employees to California to get trained on zero emissions bus operations and maintenance. AC Transit’s comprehensive training program blends training and requires each employee to complete the training before they can go into service. ACT’s new training facility, slated to open in 2026 will feature classrooms, simulation of operational situations, vehicle maintenance procedures, and emergency scenarios for hands-on learning. There may be potential to partner with them to mimic the program in the Midwest and attract interested candidates that do not have the luxury to travel across the nation for training and also develop the workforce that is in the Midwest.

¹²¹ Brette Foote. *Ford Launches \$1 Million Scholarship For Technician Training* (March 2023) at https://fordauthority.com/2023/03/ford-launches-1-million-scholarship-for-technician-training/#google_vignette.

¹²² Audi Certified Technicians graduate from schools Audi has partnered with. Find out more on Audi’s website <https://aep.audiusa.com/jobs/home/>.

¹²³ Urban Institute, *Competency-Based Occupational Framework for Registered Apprenticeship, Transit Bus Technician*. Jan 2018 at https://www.urban.org/sites/default/files/2018/06/14/full_framework_bus_technician_1.pdf.

employees for the green energy change, so creating a training program is a sure way to entice recruits who desire to be skillful in present-day technologies and upcoming advancements.

Teaching employees new skills also creates higher retention percentages, loyalty, and a positive culture. Training employees on what is coming will also encourage them to embrace change because they'll be prepared for it. To capitalize here, leaders will be required to complete some workforce strategic planning to forecast and figure out the skills needed within each department. This strategic plan will be a map of the organization and the plan for the future. If leaders don't focus on skill development, they risk losing talent to companies that do. Most employees (75%) seek career development.¹²⁴ Upskilling and reskilling provide that incentive, and the Workforce Strategic Plan creates the internal opportunities guide for managers to encourage those invested employees and support their journey. In today's working world, job security and progressive opportunities are highly sought after. Leaders can measure skills using skill-based assessments and integrate technology and human potential.

Below are 8 examples of reskilling and upskilling approaches.¹²⁵

BLENDDED TRAINING	Training that requires two or more methods of delivery which must be completed in order to satisfy the educational requirements.
CAREER PATH	A progression of positions in one or more occupational series
COACHING	Partnering with individuals in a thought-provoking and creative process that inspires them to maximize their personal and professional potential.
DETAIL	A temporary assignment of an employee to a different position for a specified period, with the employee returning to his or her regular duties at the end of the assignment.
MENTORING	A process that focuses specifically on providing guidance, direction, and career advice. It is usually a formal or informal relationship between a senior mentor (usually outside the protégé's chain of supervision) and a junior protégé.
ON THE JOB TRAINING	Formal methods/activities are planned and structured to promote learning through activities and tasks.
ROTATIONAL ASSIGNMENT	Developmental assignment away from an employee's current position. During these assignments, individuals learn to adapt and

¹²⁴ Jack Flynn. 35 KEY EMPLOYEE TRAINING AND DEVELOPMENT STATISTICS [2023]: DATA + TRENDS. Mar 2023 at <https://www.zippia.com/employer/employee-training-development-statistics/>.

¹²⁵ See reskilling toolkit at <https://www.opm.gov/policy-data-oversight/workforce-restructuring/reshaping/accelerating-the-gears-of-transformation/reskilling-toolkit.pdf>.

	successfully lead in a new position.
SHADOWING ASSIGNMENT	Observing a leader in daily activities for a defined period of time. By watching leaders in action, the program participant gains exposure to leadership duties, responsibilities, and approaches and observes how concepts learned are applied in real situations.

IV. Funding

Section III of the Fall 2023 LT&PP Team Report addressed Laws & Regulations: Compliance and Funding/Incentives. All laws and regulations discussed in that section were still in place as of May 2, 2024. This Section IV of our Report describes some notable developments between the end of the Fall 2023 semester and May 2, 2024 regarding potential funding opportunities that might relate to fleet conversions.

A. Information Re: Selected Federal Programs

1. Recent DOT Funding Awards Activity

The Infrastructure Investment and Jobs Act (Pub. L. 117-58, November 15, 2021, “Bipartisan Infrastructure Law,” or “BIL”) authorized and appropriated \$1.5 billion annually to be awarded by the federal Department of Transportation (“DOT”) 2022 – FY 2026 for Local and Regional Project Assistance Program Grants under National Infrastructure Investments. The program is codified at 49 U.S.C. 6702.

On November 30, 2023, DOT published a Notice of Funding Opportunity (NOFO) for \$1.5 billion in grant funding through the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) discretionary grant program for 2024. Half of the funding will go to projects in rural areas, and half of the funding will go to projects in urban areas. At least \$15 million in funding is guaranteed to go towards projects located in Areas of Persistent Poverty or Historically Disadvantaged Communities, and projects located in these areas will be eligible for up to 100 percent federal cost share, as directed by Congress in the Bipartisan Infrastructure Law. The Department also intends to use the RAISE program to support lowering costs for household budgets, wealth creation, and the creation of good-paying jobs with the free and fair choice to join a union, the incorporation of strong labor standards, and training and placement programs, especially registered apprenticeships.¹²⁶ Although the deadline to apply has passed, this opportunity is included in this report so that the City and KCATA can prepare to apply again for FY 2025, perhaps after studying projects in such places as Raleigh, NC, New London, CT and

¹²⁶U.S. Department of Transportation RAISE Discretion Grants description available at <https://www.transportation.gov/RAISEgrants>.

Connecticut Department of Transportation, City of Chicago, IL, Redford, MI, and Hampton, VA that received awards in the prior round.¹²⁷

On February 8, 2024, the Federal Transit Administration (“FTA”) announced the availability of \$1.5 billion in Fiscal Year 2024 funding to support state and local efforts to buy or modernize buses, improve bus facilities, and support workforce development.¹²⁸ Once awarded, funds remain available for four fiscal years. This includes the fiscal year in which the amount is made available or appropriated, plus three additional years. All eligible expenses under the Low-No Program are attributable to compliance with the Clean Air Act and/or the Americans with Disabilities Act.¹²⁹ The Federal share of the cost of leasing or purchasing a transit bus is not to exceed 85 percent of the total transit bus cost. The federal share in the cost of leasing or acquiring low- or no-emission bus-related equipment and facilities is 90 percent of the net project cost. Applicants must identify these specific activities in their application in order to receive this increased federal share.

On March 25, 2024, DOT published a NOFO announcing \$5.1 Billion in Multimodal Project Discretionary Grant (MPDG) funding - public transportation projects are eligible. Applications are due by May 6, 2024, on Grants.gov.¹³⁰ Available funding includes

- \$1.7 billion for the National Infrastructure Project Assistance (“Mega”) program: The Mega program is a funding source for large infrastructure projects that benefit the nation or a region. These projects are typically too expensive for traditional funding methods and can include improvements to highways, bridges, railways, ports, and public transportation. The program allocates half of its funds to very

¹²⁷ U.S. Department of Transportation. *RAISE 2023 Fact Sheets* at https://www.transportation.gov/sites/dot.gov/files/2023-06/RAISE%202023%20Fact%20Sheets_2.pdf. The City of Raleigh used their awarded funds to construct a new joint operations and maintenance facility in a historically disadvantaged community. The Connecticut Dept of Transportation used their awarded funds to purchase battery-electric buses, and update transportation infrastructure. The City of New London, CT used their awarded funds partly to construct a transit hub and a public parking garage. The City of Chicago used their awarded funds to purchase and install up to six overhead bus chargers on various routes that use the bus terminal. Michigan used their awarded funds to construct electric vehicle charging infrastructure in Redford, Michigan for vehicle classes 1 to 8. The Transportation District Commission of Hampton Roads used their award to replace their 39-year-old Parks Avenue Maintenance Facility to accommodate future zero-emission buses. Cities across the nation was applied for this funding in creative manners to further the goals of their Green Energy Plans.

¹²⁸ Federal Transit Administration. *Biden-Harris Administration Announces Availability of \$1.5 Billion in Federal Funding to Modernize Bus Fleets and Deploy Clean Transit Buses Across America*, Feb 8, 2024, at <https://www.transit.dot.gov/about/news/biden-harris-administration-announces-availability-15-billion-federal-funding-modernize>.

¹²⁹ The Low-No Program refers to a specific grant program administered by the Federal Transit Administration (FTA) in the United States. "Low-No" stands for "Low or No Emission Vehicle Deployment Program." Find out more at <https://www.federalregister.gov/documents/2024/02/08/2024-02246/fy-2024-competitive-funding-opportunity-low-or-no-emission-grant-program-and-the-grants-for-buses>.

¹³⁰U.S. Department of Transportation MDPG Program Notice of Funding Opportunity available at <https://www.transportation.gov/grants/mpdg-program>.

large projects exceeding \$500 million and the other half to moderately large projects between \$100 million and \$500 million.

- \$2.7 billion for the Infrastructure for Rebuilding America (“INFRA”) program: The INFRA program also helps urban areas through competitive grants for freight and highway projects. These projects aim to improve safety, reduce congestion, and make transportation more efficient within and around cities. This can involve improvements for both freight movement and public transportation.

2. Assistance Re: Buses and Bus Facilities

There are just two rounds left to secure federal grant aid under the Bipartisan Infrastructure Law for FY 2025 and 2026. Other competitive grant opportunities are also dwindling. Now is the ideal moment to start crafting proposals for next year. Many other cities and states have integrated various departments and services into their proposals.

It could be beneficial for KCMO and KCATA to collaborate on a large project. Such a project might include funding for vehicles, new alternative fuel infrastructure to support vehicles, offices, and employee spaces, and potentially establishing a Transit Training Consortium facility.¹³¹ This consortium facility could enhance skills across various roles—from operators to maintenance technicians, software developers, and high voltage technicians—in KCMO. It could also attract candidates from surrounding cities and states to Kansas City, bolstering recruitment and retention efforts significantly. KCMO and KCATA may consider partnering with Parsons Corporation, which has successfully received aid for similar multidisciplinary projects in Oakland, CA, Denver, CO, NYC, and other projects across the globe.¹³² By collaborating effectively on a large project under the Low-No Grant, the City and KCATA can leverage their respective strengths and resources to create sustainable, innovative transit solutions that benefit the community as a whole.

The Federal Transit Administration (“FTA”) is partnering with the Joint Office of Energy and Transportation¹³³ to offer technical assistance to transit agencies transitioning fleets

¹³¹ A transit training consortium is the collaboration between numerous transit organizations to provide technical training for employees and prospective employees of the transit industry. The State of Sustainable Fleets, *Small and Medium Fleets: Transitioning to Clean Vehicle and Fuels* discusses one in their webinar cited *supra* note 85; the AC Transit Zero Emission Bus (ZEB) Training Facility-Oakland, CA is another option, note 120-8, California Transit Training Consortium is an organization that has been around for a number of years, find out more at <https://www.scrttc.com/>; and the Mineta Transportation Institute provides a Skills Gap & Needs Assessment for other organizations with plans to create their own Consortium, find out more at https://scholarworks.sjsu.edu/mti_publications/308/.

¹³² Parsons Corporation, *AC Transit Zero Emission Bus (ZEB) Training Facility-Oakland, CA*, *supra* note 120.

¹³³ The Joint Office of Energy and Transportation was created through the Bipartisan Infrastructure Law (BIL) to facilitate collaboration between the U.S. Department of Energy and the U.S. Department of Transportation. The Joint Office will provide support and expertise to a multitude of programs that seek to

from diesel vehicles to low- and no-emission buses and ferries. Established by the Bipartisan Infrastructure Law, the Joint Office supports transit entities moving to battery electric, hybrid, or hydrogen fuel cell technology that reduces greenhouse gas emissions and prepares the transit workforce with new skills and expertise. This technical assistance is available to transit agencies and entities receiving – or planning to apply for – federal funds to expand or transition their fleets with clean and green buses and transit vehicles.¹³⁴ Numerous localities have used these funds to purchase new buses, purchase new infrastructure to accommodate low-or-no-emission buses, renovate or construct new facilities, update training, and recruit new candidates.¹³⁵ The Bipartisan Infrastructure Law Fact Sheet below provides the federal grant plan over years 2022-2026 for buses and bus facilities.



BIPARTISAN INFRASTRUCTURE LAW FACT SHEET
GRANTS FOR BUSES AND BUS FACILITIES

Fiscal Year	2022 (in millions)	2023 (in millions)	2024 (in millions)	2025 (in millions)	2026 (in millions)
Grants for Buses and Bus Facilities (Formula)	\$604	\$617	\$633	\$646	\$662
Grants for Buses and Bus Facilities (Competitive)	\$376	\$384	\$394	\$402	\$412
Low or No Emissions Grants (Competitive)	\$1,122	\$1,123	\$1,125	\$1,127	\$1,128

Note: The Bipartisan Infrastructure Law provides both authorized future funding from the Mass Transit Account of the Highway Trust Fund and advance annual appropriations, both of which are included in the table shown above.

deploy a network of electric vehicle chargers, zero-emission fueling infrastructure, and zero-emission transit and school buses. More information can be found at <https://driveelectric.gov/>.

¹³⁴ Federal Transit Authority page describing Low and No-Emissions Vehicle Technical Assistance Program available at <https://www.transit.dot.gov/funding/grants/low-and-no-emission-vehicle-federal-technical-assistance>.

¹³⁵ The Alameda-Contra Costa Transit District (AC Transit) was awarded \$25.5 million through the Federal Transit Administration’s prestigious 2023 Bus and Low-and No-Emission Grant Awards (Low-No Grant). See Press Release at <https://www.actransit.org/press-release/ac-transit-receives-coveted-bus-low-no-grant-awards>. AC Transit will use the funding to build a state of the art training center, purchase new HFC buses, and develop the workforce through enhance training programs, create new professional development, and expand our mentorship programs. During an interview, Brittany Meeker of Champaign-Urbana mentioned the transportation authority used Low-NO grant funding from the FTA. The whole project was around \$20 million.

3. Environmental Protection Agency Grant Programs

The Environmental Protection Agency (“EPA”) offers several other competitive grants, which many cities across the US have also been awarded for their projects. These grants are also published on a rolling basis. The table below describes grants that fund buses, infrastructure, and other opportunities to recruit nontraditional demographics.

Name of Program	Source	Amount(\$)	Deadline	Purpose
FY24 Women in Apprenticeship and Nontraditional Occupations (WANTO) Technical Assistance Grant Program	grants.gov/search-results-detail/351374	between \$350,000 and \$750,000	6/10/24	Applicants may propose to provide technical assistance to support women’s participation and success in the full range of industries in which women are traditionally underrepresented or disproportionately concentrated in lower-wage occupations.
FY2024 Competitive Funding Opportunity: Buses and Bus Facilities Program	grants.gov/search-results-detail/352254	\$39,004,582	4/25/24	to assist in the financing of buses and bus facilities capital projects
FY2024 Competitive Funding Opportunity: Low- or No-Emission Program	grants.gov/search-results-detail/352255	\$1,103,963,762	4/25/24	For the purchase or lease of zero-emission and low-emission transit buses, including acquisition, construction, and leasing of required supporting facilities.
Fiscal Years 2022, 2023, and 2024 Prioritization Process Pilot Program	grants.gov/search-results-detail/352578	\$2 million	5/1/24	FHWA seeks to award prioritization process pilots under PPPP that include a public involvement plan that ensures transparency, accessibility, and accountability to the public throughout the development of the prioritization process, its implementation, and its use.
Active Transportation Infrastructure Investment Program	https://www.transportation.gov/rural/grant-toolkit/active-transportation-infrastructure-	\$100,000 - \$15,000,000	06/17/24	To provide safe and connected active transportation facilities in active transportation networks or active transportation spines.

B. State of Missouri Developments

We found no significant developments on our subject matter to report here.

V. Community Engagement

Community engagement is based on the democratic idea that everyone who is affected by an issue that impacts their community should have a say in the decision-making around it.¹³⁶ Members who live in a community need to be able to advocate for the services that would best aid them. Community engagement is the process in which those implementing the change bridge the gap with those who are residing in the community.

A. What is Equitable Engagement?

Public engagement is synonymous with public participation. At its core, it is built upon civic cooperation and community advocates. Without the voices, policy implementations would serve a limited value. Equitable engagement is the practice of: (1) conducting change motivated by a desire for inclusiveness; (2); advancing social justice by improving equity in how services are distributed; and (3) diversifying the influence of decision-making.¹³⁷ Equitable engagement comes in many forms and offers a multipronged approach to increasing inclusiveness.

An example of equitable engagement that has become an industry best practice is offering translation services. Other industry best practices include better advertising, providing childcare and transportation, and choosing accessible locations.¹³⁸ Some popular approaches to equitable engagement follow two philosophies: collaboration or co-production.¹³⁹ Collaboration is the most common of the two forms and decisions are reached through delegated power.¹⁴⁰ Delegated power comes from structures of participation such as having community boards or information-gathering sessions that are

¹³⁶ Sally Hussey, *What is Community Engagement?* | Engagement 101” available at <https://granicus.com/blog/what-is-community-engagement/>.

¹³⁷ Linovski & Baker 2023, “Community-Designed Participation: Lessons for Equitable Engagement in Transportation Planning” available at <https://journals.sagepub.com/doi/10.1177/03611981221145131>.

¹³⁸ *Id.*

¹³⁹ *Id.*

¹⁴⁰ Eosa Gonzalez, *The Spectrum of Community Engagement to Ownership* (2019), available at <https://movementstrategy.org/resources/the-spectrum-of-community-engagement-to-ownership/>.

community-led.¹⁴¹ Collaboration methods of public engagement are still transactional.¹⁴² Decisions are being guided by staff workers while remaining informed by what community advocates deem acceptable. It relies on a strong base of community organizing.

The top-tier approach to equitable engagement is that of co-production. This method emphasizes an all-encompassing approach to collaborating with historically marginalized communities.¹⁴³ The whole process from problem definition to solution development and implementation is driven by multi-stakeholder community partnerships.¹⁴⁴ This method is often quoted as being the best way to best policy solution in terms of equitable engagement.¹⁴⁵

Kansas City Focus

KCMO has a newly adopted Comprehensive Plan entitled “KC Spirit Playbook” (2023, Updated January 2024) cited below. This is a huge endeavor that affects the entire City. During the 3 year process, the City took many measures to reach historically underserved communities. These efforts incorporated activities and structures that blended the collaboration and co-production models of equitable engagement.¹⁴⁶

- Creation of Citizen Empowerment Committee
- Issue inventory
- Vision and Goal co-creation
- Strategy Sessions with stakeholders
- Community Supported Actions

Greenhouse gases that are emitted by the current fleet vehicles affect everyone in the community. Each resident of the City has a vested interest in clean air and water. Engaging the public entails motivating residents to engage and act with the City in positive and constructive ways. A way to meaningfully engage residents of the City has been targeted efforts in neighborhood outreach, idea creation events held at site-specific locations, and online website interactions.

¹⁴¹ *Id.*

¹⁴² *Id.*

¹⁴³ *Id.*

¹⁴⁴ *Id.*

¹⁴⁵ *Id.*

¹⁴⁶ *Id.*

B. Who Are We Engaging?

Kansas City is a large metropolitan area. There are unique challenges to services in such a large area while having a thin tax base. As such, it is necessary to define and distinguish regional differences that will impact equitable engagement in transportation planning. The entire KC Metro region has fleet vehicles operating within it, in some capacity. However, the downtown and midtown areas are where bus routes are saturated.¹⁴⁷

1. Greater KC Metro

Kansas City is unique in its geographical setting. It has the population of a mid-sized city, spread across a huge land area.¹⁴⁸ Kansas City is reported to be the 25th largest city by total area.¹⁴⁹ This presents unique challenges and solutions to its problems. City leaders must think on a large scale while balancing finite funding resources. Having large geographical barriers between various neighborhoods in the City means that there are competing needs for these limited resources. Communities found in neighborhoods by Westport and different than those found in Riverside. Yet, the differences in these communities must be considered and advocated for. As such, a conversation about engagement is different for the greater KC Metro area. Above the river, The Northland, is the only area of the City to see population growth in the last decade.¹⁵⁰ This is a largely white, high school and college graduate, middle-class population.¹⁵¹

2. KC Core

The core of Kansas City is widely different from the needs of the whole. There are a multitude of neighborhoods that are among the KC core land area. Neighborhoods from 18th and Vine to Waldo encompass the core.¹⁵² The needs of the KC core community are vastly different from those of greater KC. The Kansas City core residents are in historically underserved communities.¹⁵³ These areas have a concentration of poverty, high unemployment, and lower life expectancy.¹⁵⁴ The residents within the core area, mostly racial and ethnic minority groups, need to be included and incorporated into the process to align with the KC Spirit mission because they have been historically ignored.

¹⁴⁷ KCATA, System Map for RideKC | Rider Guide at <https://ridekc.org/rider-guide/system-map>.

¹⁴⁸ Skidmore, Owings. n.d. "Kansas City, Missouri." Wikipedia at https://en.wikipedia.org/wiki/Kansas_City,_Missouri.

¹⁴⁹ *Id.*

¹⁵⁰ *Id.*

¹⁵¹ Data USA: Kansas City, MO at <https://datausa.io/profile/geo/kansas-city-mo/>.

¹⁵² mySidewalk, *About the Downtown KC Dashboard | Downtown KC Dashboard* at <https://dashboards.mysidewalk.com/state-of-the-downtown-kcmo/about>.

¹⁵³ City of Kansas City, MO, *KC Spirit Playbook* (2023, updated January 2024) at <https://playbook.kcmo.gov/>.

¹⁵⁴ *Id.*

Transportation Differences

The greater KC area does include transportation routes, but most are concentrated in the KC core area.¹⁵⁵ How greater Kansas City and the Kansas City core utilize transportation services varies. The largest concentration of bus stops are found within the core area.¹⁵⁶ This means that equitable engagement with the core area must be a high priority. The core neighborhoods and residents will be the most impacted in Kansas City.¹⁵⁷

Kansas City Focus

The large geographical land area that makes up Kansas City, MO poses a wicked problem in terms of engagement. The greater KC area is fundamentally different than that of the KC core area.¹⁵⁸ As such, different community engagement tasks and practices will be needed. Within the scope of electrifying the city fleet vehicles, it must be considered who is going to be impacted the most. Instead of engaging in a citywide effort, it is recommended that the City focus on engagement areas within the KC core land area. This area can be defined by zip codes.

KC Core Zip Codes:

- 64109
- 64110
- 64127
- 64128
- 64130
- 64131
- 64132

These zip codes coincide with recognized economic distress areas in Kansas City¹⁵⁹. In order to fully engage in equitable community engagement, these area codes need to be targeted for participation.

1. Demographics

As previously mentioned, there are large differences between the greater and core areas in Kansas City, including different levels of service. The KC core has a wider variety of routes and service options than found in the outer reaches of the city center.¹⁶⁰ With the

¹⁵⁵ KCATA 2023, "RideKC System Map" at <https://ridekc.org/assets/uploads/route-maps/SystemMap.pdf>.

¹⁵⁶ KC Open Data, "KCATA Bus Stops" at https://data.kcmo.org/Transportation/KCATA-Bus-Stops/bd2s-bfst/about_data.

¹⁵⁷ City of Kansas City, MO, *KC Spirit Playbook*, *supra* note 153.

¹⁵⁸ *Id.*

¹⁵⁹ mySidewalk, *About the Downtown KC Dashboard | Downtown KC Dashboard* *supra* note 152.

¹⁶⁰ KCATA, "Regional Transit Map" at <https://transitmap.net/ridekc-system-map-2021/>.

city center being a hub for transportation, it is necessary to distinguish defining characteristics of the core. Demographics will help establish the audience for community engagement. It is vital to understand the population in which an organization is working to best serve its residents. Using the zip codes attached to the economic distress areas we can visualize and detail the divide.¹⁶¹ The core area is one that can be characterized as a historically underserved community. It has characteristics such as a “poverty rate over 30%, an unemployment rate 1.5x or more than the national average, or a median household income that is less than 60% of the area median income”.¹⁶²

Key Demographics ¹⁶³			
Population	Household Income	% Below Poverty Level	Demographics
<u>KC Core (EDA): 112,172</u>	<u>KC Core (EDA): \$49,680</u>	<u>KC Core (EDA): 25%</u>	<u>KC Core (EDA):</u> Percent Black - 55% Percent White - 27% Percent Hispanic - 11%
<u>Greater KC: 505,958</u>	<u>Greater KC: \$65,256</u>	<u>Greater KC: 14%</u>	<u>Greater KC:</u> Percent Black - 26% Percent White - 55% Percent Hispanic - 11%

2. Communication Practices

Prioritizing an inclusive science communication practice is necessary for equitable community engagement.¹⁶⁴ Science is at the core of the conversion of the KC fleet vehicles to an alternative fuel source. Accordingly, inclusive science communication must be exercised to avoid undeserving historically marginalized groups.¹⁶⁵ As one source says: The “aim of community engagement should be to cultural intersectionality by honoring multiple ways of knowing, elevating and valuing diverse perspectives, and creating a space for communities to share personal experiences and stories about

¹⁶¹ mySidewalk, *About the Downtown KC Dashboard | Downtown KC Dashboard supra* note 152.

¹⁶² Kansas City, MO, *KC Spirit Playbook, supra* note 153.

¹⁶³ *Id.*

¹⁶⁴ Casey L. Marsh, Anne U. Gold, and Brigitta Rongstad Strong, *Elevating community voices through inclusive science communication: a case study of the We are Water program in the Southwestern United States* (2023), available at <https://www.frontiersin.org/articles/10.3389/fcomm.2023.1214105/full>.

¹⁶⁵ *Id.*

[alternative fuels] through science communication.”¹⁶⁶ Creating communication styles that incorporate multiple ways of knowing, diverse perspectives, and a conversational tone is key to engaging with historically marginalized groups. It is vital to make the engagement interesting while not overpowering or utilizing jargon that would be alienating.

Kansas City Focus

There are four key communication practices that need to be considered while engaging residents¹⁶⁷

1. Consistent, Accurate, & Informative Engagement
2. Offer Online Communication Methods
3. Incorporate Offline Communication
4. Geo-Location, Mapping, and Attribution

C. Community Engagement Steps

Strategies that enhance the relationship between the governing organization and underserved communities are essential to equitable engagement. To reach the goal of equitable engagement, an emphasis on activities must take place within the urban core. There needs to be a concentrated effort in addressing this community by building and maintaining key partnerships. Forming these partnerships is vital to success. Community champions will be able to advocate for changes in their neighborhoods, surrounded by their local community.

Kansas City Focus

Major goals of the community engagement act as guides throughout the entire process. KCMO is familiar with community engagement activities as evidenced by the multitude of projects happening around the city. Goals need to reflect a proactive approach to engagement:¹⁶⁸

- 1) Giving a voice to those most impacted by bus conversion
- 2) Creating opportunities for community members to be involved in systems change
- 3) Educating the public on alternative fuel systems and transportation planning
- 4) Raising awareness about resources for those impacted by service changes

¹⁶⁶ *Id.*

¹⁶⁷ PublicInput, *4 Communication Strategies to Expand Community Engagement* at <https://publicinput.com/wp/4-communication-strategies-to-expand-community-engagement/>.

¹⁶⁸ Travis Reginal and Rod Martinez, *Community Engagement Strategies to Advance Justice Reform* (2023), available at <https://www.urban.org/research/publication/community-engagement-strategies-advance-justice-reform>.

VI. Safety

As with any new emerging technology, there are safety concerns. Hydrogen fuel cells are not yet widely used in a commercial sense. As such, implementation and best practices are in the forming stage. The forming stage inherently entails some trial and error; however, there is little room for error when dealing with human lives. There are two main types of stakeholders interacting with this emerging technology: operators and end users. The safety requirements overlap in some areas while differing in others.

A. Operator

Operators of the hydrogen fuel cell vehicles are interacting with the equipment in an industrial setting. These are individuals who are maintaining, fueling, and storing these vehicles. In a conversation with the KCATA Project Manager William Yord, we learned that some of their operating concerns are that of operational efficiencies and

“Specifically, hydrogen has a wide range of flammable concentrations in air and lower ignition energy than gasoline or natural gas, which means it can ignite more easily. Consequently, adequate ventilation and leak detection are important elements in the design of safe hydrogen systems. Because hydrogen burns with a nearly invisible flame, special flame detectors are required.”

dependability. As stated by the U.S. Department of Energy’s Office of Energy:¹⁶⁹

Along with the flammability of the fuel, electrical shock from hydrogen vehicles is also a great concern. Some key components of the vehicle will be powered by electricity such as the air conditioner and current generated from the fuel cell itself. A summary of the safety concerns is set out in the below table.

¹⁶⁹ Office of Energy Efficiency and Renewable Energy, *Safe Use of Hydrogen* at <https://www.energy.gov/eere/fuelcells/safe-use-hydrogen>.

High Pressure ¹⁷⁰	To convert hydrogen into a liquid state, it requires extremely high pressure. Compressed hydrogen is stored at 2,000, 5,000 or 10,000 psig. These ranges reflect industrial storage pressures to fueling pressures.
Material Selections ¹⁷¹	Due to the chemical nature of hydrogen, the materials used to store the raw materials, along with the vehicles powered by it, needs special considerations. Aluminum is the current standard for storage and infrastructure ¹⁷² . Pure aluminum is costly.
Odor ¹⁷³	Hydrogen fuel cannot be odorized. This makes the detection of leaks very difficult. Special detection systems are necessary for gas leaks and fires.
Color ¹⁷⁴	Nitrogen burns at near colorless flame in direct sunlight. Effectively invisible, combined with an upward disbursement of energy means that special attention to where hydrogen vehicles are fueled and stored is necessary.

These are the known industry hazards. Along with the documentation that exists outlining the hazards associated with this type of alternative fuel, the subject matter excerpts interviewed had some insight into safety risks and mitigation tactics. In a conversation with a KCATA Project Manager, the fire mitigations that needed to be in place was discussed. The heavier vehicles, the compressed gas buses, needed to be housed in

¹⁷⁰ The International Consortium of Fire Safety, Health, & the Environment, *Safety Issues regarding fuel cell vehicles and hydrogen fueled vehicles*, at <https://dps.mn.gov/divisions/sfm/document-library/Documents/Responder%20Safety/FuelCellHydrogenFuelVehicleSafety.pdf>.

¹⁷¹ National Fire Prevention Association, *NFPA 2 Overview: SoCal Fire Prevention Officers*, available at <https://www.ourair.org/wp-content/uploads/THRPAppendixC7.pdf> (discussing “Need for a National Hydrogen Code” and various related issues).

¹⁷² Nancy W. Stauffer, *Using aluminum and water to make clean hydrogen fuel — when and where it’s needed* available at <https://news.mit.edu/2021/using-aluminum-and-water-to-make-clean-hydrogen-fuel-0812>.

¹⁷³ National Fire Prevention Association, *NFPA 2 Overview: SoCal Fire Prevention Officers*, *supra* note 171.

¹⁷⁴ *Id.*

special areas due to the flame qualities of the CNG. Along with concern for CNG, there have been safety concerns about EV batteries catching fire. In this type of scenario, fire is not the only safety consideration; it also becomes an electrical hazard to those responding to the crisis.

B. End User

Since hydrogen is an emerging technology in the transportation industry, safety standards are still evolving. There is little documentation about the user experience of hydrogen buses. With that in mind, there are some obvious overlaps that would apply to both the operators and customers. Flammability is a huge concern. Typically, the fuel cells on public transportation buses are stored in the rear of the bus. The storage area of the fuel cell would have to be contained in fire-safe materials. Additionally, sensors would need to be installed on the vehicles to detect any leaks that might occur.

VII. Recommendations and Next Steps

A. Summary of Some Specific Recommendations

We have offered several recommendations in the foregoing Sections of this Report. This Section II.A. will summarize a few of them for KCMO and the KCATA to consider in planning in planning for transitions to alternative fuel vehicles. Finally, Section VII.B. will then add some suggestions regarding potential future actions in such planning.

1. Alternative Fuel Vehicles (Primarily based on Section II above):

- a. For the City's fleet of Class 1-2a vehicles which are capable of transition to the above discussed alternative fueling options, it is recommended that the City take due regard of the aforementioned limitations and benefits of each alternative fuel type when determining their preferred direction for transition to alternative fuel vehicles—which suggest EVs may be the best current fit. Of primary importance for consideration may be that hydrogen fuel cell vehicles in these classes' increased range and cost in combination with their limited technical abilities compared to the EV counterparts. The City should of course keep an eye on ongoing developments with potential technologies for *all* of its classes of vehicles (and their varied functions and related performance requirements) in relation to cost efficiency, environmental benefits, and infrastructure needs, as it continues to monitor the technology and market trends to ensure an adequate supply of vehicles that meet the City's needs. One potentially interesting technology that has been

highlighted by Daniel Williams is the Cummins Hydrogen Internal Combustion Engine.¹⁷⁵ No vehicle has been announced that utilizes the engine yet, but this possibility is noted as a subject for future research.

- b. For the KCATA's fleet of buses, we recommended that the KCATA take due regard of the aforementioned limitations and benefits of each alternative fuel type when determining their preferred direction for transition to alternative fuel buses. Of primary importance for consideration should be hydrogen fuel cell buses increased range but also increased costs when compared to their EV counterparts. Furthermore, as emphasized in Section II, while CNG buses are a good way to decrease GHG emissions, they are not a viable alternative for achieving the desired complete elimination of these emissions. Therefore, the KCATA should determine what buses best fit their needs based upon the benefits and limitations of each alternative fuel option discussed herein.

2. Workforce Development (Primarily based on Section III above)

- a. Develop Comprehensive Training Programs: Ensure all relevant personnel, including drivers, maintenance staff, and fleet managers, receive adequate training in the operation and maintenance of alternative fuel vehicles.
- b. Create Talent Development Opportunities: Focus on skill development, reskilling, and upskilling to ensure a smooth transition to new technologies. Consider partnerships with local educational institutions and industry experts to provide ongoing training and development.

3. Funding (Primarily based on Section IV above)

- a. Prepare for Future Grant Applications: KCMO and KCATA could collaborate on a large project. Such a project might include funding for city vehicles, new buses, new alternative fuel infrastructure to support charging and maintenance of various vehicles, offices, and employee spaces, and establish a Transit Training Consortium facility that can be the first of its kind in the region.
- b. Long-term Strategic Planning: If collaboration is not an option. Both organizations should develop a comprehensive strategy that integrates

¹⁷⁵ See Cummins Newsroom, *A Zero Emissions Future Starts Now: Werner Enterprises and Cummins Announce Collaboration to Integrate Cummins New 15-Liter Natural Gas and 15-Liter Hydrogen Internal Combustion Engines* (Jan. 28, 2022) at <https://www.cummins.com/news/releases/2022/01/28/zero-emissions-future-starts-now-werner-enterprises-and-cummins-announce>.

multiple funding sources to maximize financial support for fleet conversions and infrastructure projects. Start preparing applications early, particularly for FY 2025 and 2026 funding rounds, to ensure well-developed and competitive proposals. Lastly, stay abreast of new NOFO available from the EPA. Community Engagement (Primarily based on Section V above)

4. Community Engagement (Primarily based on Section V above)

- a. Implement Equitable Community Engagement: Ensure diverse and inclusive community involvement in the planning and implementation of alternative fuel vehicle transitions. Consider translating materials, providing transportation and childcare at meetings, and engaging with historically underserved communities.
- b. Use a Multi-Pronged Communication Strategy: Employ both online and offline communication methods to reach a wider audience. Include consistent, accurate, and informative messaging to ensure public understanding and support for the transition.

5. Safety (Primarily based on Section VI above)

- a. Regularly Review Safety Practices: Conduct regular audits and safety reviews to ensure compliance with best practices and regulatory requirements for alternative fuel vehicles.
- b. Monitor the issuance of new studies, reports and articles on safety assessments of the rapidly evolving fuel systems technologies for vehicles, and include educational materials on safety considerations in community engagement efforts regarding fleet vehicles conversions.

B. Potential Future Actions

For future explorations of City and KCATA fleet conversions, our Project Team offers the following additional suggestions:

1. Explore Potential Partnerships

Collaborate with energy companies such as Evergy and other private battery companies to leverage resources and expertise in sustainable energy initiatives.

2. Investigate Additional Alternative Fuel Sources to Consider

Research the feasibility of biodiesel fuel as an additional alternative, with potential collaboration with local manufacturers like Cargill.¹⁷⁶ Conduct benchmarking to compare product processes, efficiency, and sustainability metrics in the context of electric vehicle manufacturing, aiming for best practice and optimization.

3. Charging Infrastructure

Research the feasibility and implementation of bus stops equipped with charging stations, focusing on incremental charging solutions to support electric public transportation infrastructure growth.

4. Quick Reference Guide

Develop a quick reference sheet to assist stakeholders in understanding the conversion process, outlining best practices, safety protocols, and transition timelines.

CLOSING

WE APPRECIATE THE OPPORTUNITY TO PROVIDE THE INPUT EMBODIED IN THIS REPORT AND A GRATEFUL TO THE MANY INDIVIDUALS REFERENCED HEREIN WHO SHARED THEIR KNOWLEDGE AND PERSPECTIVES WITH US DURING OUR RESEARCH.

¹⁷⁶ Cargill has entered the sustainability market providing renewable fuels. One of the biodiesel plant sites is in Kansas City. They provide bio-mass based diesel and renewable diesel. Find out more at <https://www.cargill.com/sustainability/renewable-fuels>.