TRANSPORTATION SYSTEM COORDINATION

MEASURING INTEREST IN HYDROGEN REFUELING INFRASTRUCTURE IN THE MIDWEST:

A SURVEY OF DELIVERY FLEETS, HEAVY-DUTY TRUCKING, AND FUEL DISTRIBUTORS

Final Report

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Sponsored by: The Stark Area Regional Transit Authority Through the Renewable Hydrogen Fuel cell Collaborative

In collaboration with: The North American Council for Freight Efficiency

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Executive Summary

The medium and heavy-duty transportation sector is undergoing a rapid transition into the clean energy/alternative fuel market. With The Environmental Protection Agency and the National Highway Traffic Safety Administration having finalized Phase 2 emission standards to cover model years 2021-2027 for semi-trucks, large pickup trucks, and all types and sizes of buses and work trucks, a new generation of vehicles is evolving in the trucking industry. A number of new vehicle manufacturing collaborations to supply fuel cell and alternative-fueled powertrains for the trucking industry have been announced or are already being developed.

One of the major impediments to this transportation sector transition is the availability of hydrogen refueling infrastructure. While there are a number of ways to address the lack of infrastructure, planning and execution of creating the necessary infrastructure takes time. One area that could, for instance, catalyze the adoption of zero-emission vehicles is to share refueling infrastructure.

To obtain a better understanding of how we might overcome this impediment, the Ohio Fuel Cell Coalition, together with the North American Council for Freight Efficiency, undertook to survey the US trucking industry with regard to its plans for introducing hydrogen fuel cell electric vehicles into their fleets. This survey identified the trucking industry's level of interest in hydrogen-powered fleets and refueling infrastructure, and the time for the anticipated adoption of hydrogen. In so doing, the survey provides insight into when a market for hydrogen–fueled trucking might develop, and identifies expectations for the establishment and sharing of refueling infrastructure, especially as this relates to collaboration between the transits and trucking industries. Because of the implications that this transition has to the regional economy, the survey focused in particular on Ohio, Michigan and the Midwest.

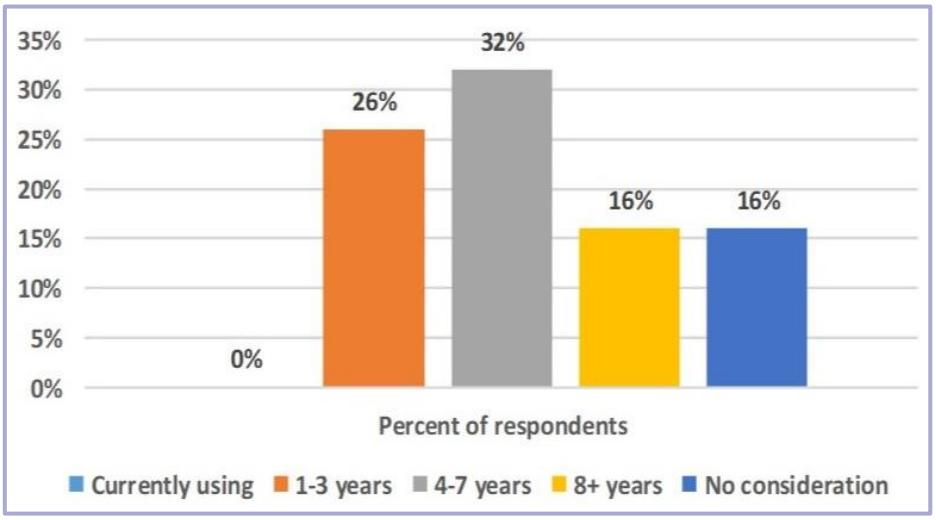
A questionnaire was developed to ascertain descriptions of the respondents' fleets and their operations, their current knowledge and level of interest in hydrogen-powered fleets or fueling, any current or planned deployment, and future projections. To identify applicable fleets, we utilized existing government and private databases. In order to promote participation in the surveys, the responses have been aggregated and anonymized.

Because early adopters of hydrogen fuel cell vehicles are likely to be long-haul fleets, our focus was on medium and heavy-duty fleets and refueling providers serving the Midwest, specifically Ohio, Michigan and their border areas. In addition to the questionnaire, a number of telephone interviews were conducted with select companies for more in-depth information. Of the 140 fleets/providers contacted, we received 22 survey responses and conducted six follow-up interviews. A total of 90% of respondents provide service to the Midwest, and almost half are nationwide companies, with 21% medium-duty and 74%

heavy-duty classifications. The usage of these fleets consisted of 74% local (single metropolitan/adjacent urban area; same-day return) and 63% long-distance (goods carried between metropolitan areas). Diesel, natural gas, and battery electric were the major fuel sources, while none of these fleets currently utilize hydrogen as a fuel type.

Fleets were surveyed on their current use, deployment, and interest in hydrogen, and the timeframe for consideration of such. Respondents identified a number of concerns to their interest and rate of adoption, which included return-on-investment, hydrogen production, distribution, and equipment purchase, and most importantly, customer demand and the need for a "proven" technology.

Figure ES-1: Timeframe for Consideration of Hydrogen-Powered Fuel Cell Vehicles



With respect to reasons for delaying hydrogen consideration, Figure ES-2 represents the top four reasons, of which limited or no refueling infrastructure was the main consideration.

Figure ES-2: Top Reasons for Delay/Non-Consideration of Hydrogen Fleets

One important fact brought out in the surveys was that "if infrastructure were available right now", almost 40% of the respondents would move up their consideration from 4-7 years to 1-3 years.

Fleets were surveyed on their interest related to the necessary hydrogen infrastructure to fuel the vehicles. Over half preferred their own refueling sites, with 68% wanting a

refueling service provider for the hydrogen, rather than creating it on-site. One third of the fleets would be interested in having limited public access to their refueling stations, which would give the ability for transit fleet usage of the trucking infrastructure.

A number of questions were directed at fueling providers, which, while small in number, play a critical role in how the infrastructure market emerges. Fueling provider respondents all service the Midwest, and three-quarters were nationwide companies. As far as timeframes for hydrogen refueling availability, all respondents indicated an interest in providing the necessary infrastructure and three quarters have a deployment plan in place. Moving forward with these plans would be based heavily on customer demand (which includes vehicle performance, proof of technology, and funding), available real estate for new stations or expansion of existing ones, scalability, and equipment design (component repair/replacement, training). These fueling providers all had a willingness to collaborate with transit for use of their refueling infrastructure.

Overall, this survey made clear that hydrogen will be a mainstream fuel for the transportation industry, especially for long haul trucking. Hydrogen refueling and infrastructure will increase proportionately with the acceptance and deployment of hydrogen fuel cell-powered fleets, which are already in the planning stages, and with the potential for commercial vehicles in series production late in 2020. The refueling providers are ready and willing to provide the necessary refueling infrastructure as demand is warranted. What is required next to enable this transition to a hydrogen transportation economy is collaborative planning among the stakeholders to ensure that a “chicken and egg” problem does not hold back development, together with government support to reduce the risk for early adopters.

1. INTRODUCTION

This report assimilates and summarizes recent and select research on the hydrogen refueling needs of the fleet and trucking industry, focusing on medium and heavy-duty utilization, and the refueling infrastructure that supplies that industry. A Scope of Services requesting this research was issued by the Renewable Hydrogen Fuel Cell Collaborative (RHFCC) in support of certain Stark Area Regional Transit Authority (SARTA) Federal Transportation Administration (FTA) grants. SARTA's and the RHFCC's interest in this research relates to the need for Transit agencies to begin replacement of their diesel fleets with zero-emission buses. One of the major impediments to this transition is the availability of hydrogen refueling infrastructure. If transit agencies and trucking fleets are able to share refueling infrastructure, it could catalyze the adoption of zero-emission fuel cell electric buses.

The trucking industry's current use of fueling resources and the level of interest in hydrogen-powered fleets/infrastructure were the main focus of this project. Surveys and interviews were conducted by the Ohio Fuel Cell Coalition (OFCC) in collaboration with the North American Council of Freight Efficiency (NACFE). Survey and interview feedback are summarized and assessed within this report, including additional feedback on the reasons and rational for consideration of hydrogen as a means of fueling. Our research focused on companies located in Ohio and the Midwest, however surveys were conducted nationwide to capture as much Midwestern activity as possible. The survey responses included service to our target areas.

2. SCOPE AND OBJECTIVE

The Scope of Services were conducted by the Ohio Fuel Cell Coalition in support of SARTA, the FTA's "No Emissions/Low Emissions" grants, and the RHFCC. The principal mission of this collaboration is to help accelerate the deployment of clean energy transportation systems, with an emphasis on the adoption of hydrogen fuel cell vehicles and their refueling and infrastructure requirements.

Transportation system coordination encompasses medium and heavy-duty trucking fleet applications, and their related hydrogen refueling infrastructure needs. The Scope of Work accesses the following for each trucking category and infrastructure:

- Identification of candidates for hydrogen fuel cell delivery fleets and infrastructure.
- Ascertain level of interest in hydrogen-powered fleets or fueling.
- Survey current knowledge and deployment of hydrogen fuel cells and refueling, future projections and planned deployment, and level of interest in deployment.
- Assimilate and interpret quantitative results from survey.
- Identify strategies for ongoing engagement.

The results and information from this effort will be used to document when we might expect a market for the hydrogen-fueled trucking industry to develop, and when this might provide the

impetus to expand the supply and delivery of alternative fuels along corridors where refueling infrastructure for alternative fuel is currently unavailable. This will support local, regional, and interregional transport using hydrogen-powered vehicles, which include medium and heavy-duty trucks and buses in the Ohio and Michigan border areas. The benefits of hydrogen have been well established, and include extended range, especially in cold weather climates,[1] and short refill times. Challenges include the availability and cost of fuel cell electric trucks, the cost to produce the fuel, and the availability of fueling infrastructure.

3. ACTION PLAN

3.1 Questionnaire Creation

To understand the current and future fueling need expectations of the trucking industry, a questionnaire was developed to gain feedback from various levels of the trucking industry. This questionnaire would ascertain a basic description of the respondent's fleet and its operations, the current knowledge and level of interest in hydrogen-powered fleets or fueling, any current or planned deployment, and future projections. Once companies were determined to be appropriate for this project, they were given the questionnaire. A copy of the questionnaire is attached hereto as Appendix A.

The following questions were developed and posed for these participants:

1. Where in the U.S. do your fleet vehicles generally operate? (Nine regions identified.)
2. What best describes how your fleet vehicles are generally used (local, long distance, and/or parcel)?
3. What is the average gross vehicle weight rating (class) of the majority of your fleet vehicles?
4. What is the approximate number of vehicle in your fleet by fuel type (eight classifications)?
5. Would you consider using hydrogen fuel cell trucks and in what timeframe?
6. What are the most important reasons to delay or not give consideration to hydrogen fuel cell vehicles in your fleet? (Eight choices)
7. What percent of your fleet would you consider for hydrogen fuel cell vehicles?
8. What is your preferred ownership structure for refueling infrastructure (company owned/third party, or N/A)?
9. Do you currently have hydrogen refueling on-site and how many? If no, would you consider company-owned on-site or a refueling provider?

[1] *See* Henning, Mark; Thomas, Andrew R.; and Smyth, Alison, "An Analysis of the Association between Changes in Ambient Temperature, Fuel Economy, and Vehicle Range for Battery Electric and Fuel Cell Electric Buses" (2019). *Urban Publications*. 0 1 2 3 1630. Found at: https://engagedscholarship.csuohio.edu/urban_facpub/1630.

10. If you currently have or plan to have refueling infrastructure, what is your preferred accessibility (public, limited, or no access) to it?
11. If public hydrogen refueling infrastructure were available right now, would it change your level of interest to add fuel cell vehicles to your fleet, and if so, in what timeframe?
12. Any additional comments.

In addition to the questionnaire, telephone interviews were conducted with select companies for more in-depth responses and further clarifications.

Finally, this project also included a separate series of questions that were specifically posed to hydrogen infrastructure providers. A copy of the provider questionnaire is attached hereto as Appendix B. The responses thereto will be detailed later in the report in section 5.3, under the "Hydrogen Infrastructure Providers" heading.

3.2 Identification of Fleet Candidates

This project's initial focus was on delivery, medium, and heavy-duty fleets serving Ohio and the Midwest. To determine the fleet classifications, we utilized the following gross vehicle weight rating (GVWR) classification, which classes are defined by the maximum-rated weight of the vehicle and cargo, including passengers.[2] GVWR is applied to trucks or trailers, but not the two combined.

Table 1: Gross Vehicle Weight Rating Range

Class	Gross Vehicle Weight Rating Range:
Class 1	GVRW 0 - 6,0000 lbs.
Class 2	GVWR 6,001 - 10,000 lbs. (subdivided into 2 classes, Class 2A & 2B, see below)
Class 2A	GVWR 6,001 - 8,500 lbs.
Class 2B	GVWR 8,501 - 10,000 lbs.
Class 3	GVWR 10,001 - 14,000 lbs.
Class 4	GVWR 14,001 - 16,000 lbs.
Class 5	GVWR 16,001 - 19,500 lbs.
Class 6	GVWR 19,501 - 26,000 lbs.
Class 7	GVWR 26,001 - 33,000 lbs.
Class 8	GVWR over 33,000 lbs.

[2] *See* https://www.dieselhub.com/tech/truck-classifications.html

For our purposes, the trucks were categorized into three groups:

1. **Light-duty trucks** are classified as class 1-3 trucks.
2. **Medium-duty trucks** are classified as class 4-6 trucks.
3. **Heavy-duty trucks** are classified as class 7-8 trucks.

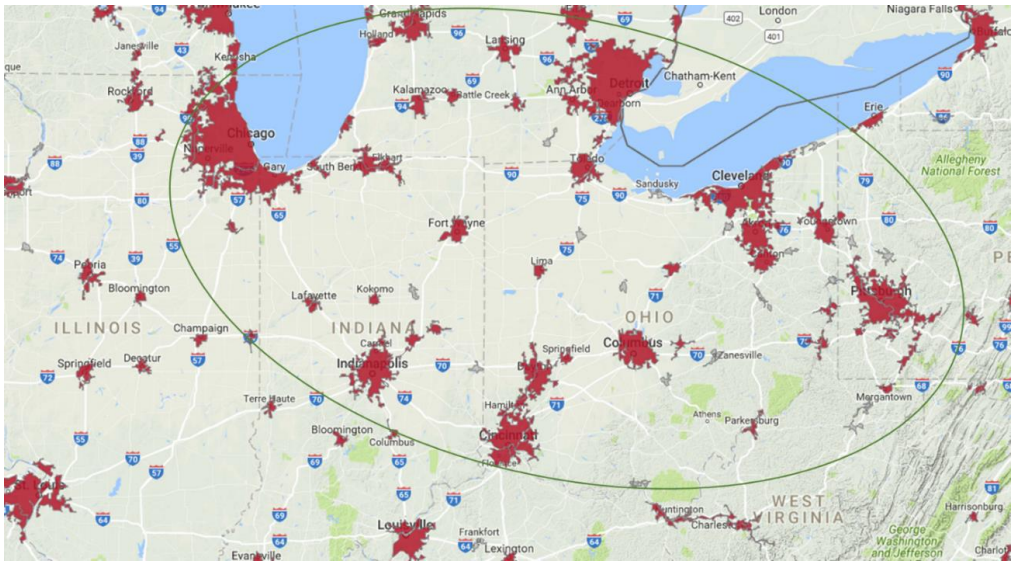
Initial research to identify applicable fleets was completed through internet searches, networking and contacts, prior research, and collaboration with government, fleets, and non-profit entities. This information was gleaned from existing databases held by the North American Council on Freight Efficiency (NACFE) for its own zero-emission Class 8 heavy-duty tractor research. The OFCC relied in part upon NACFE expertise and contacts to develop its plan to disseminate the questionnaire and to conduct interviews.

4. IMPLEMENTATION AND OUTREACH

A concerted, targeted outreach effort was conducted. While we were particularly interested in the areas of Ohio and its bordering states, many of our respondents carry freight nationwide.

Figure 1 below sets forth the Midwest Priority Region (as identified by CALSTART, on behalf of the RHFCC), as the most likely deployment area for alternative refueling infrastructure in the Midwest.[3] Trucking companies that operated within this area were targeted for outreach.

Figure 1: Midwest Priority Region



[3] CALSTART, *Hydrogen Roadmap for the U.S. Midwest Region*, (July 2017, pg. 28) http://www.midwesthydrogen.org/site/assets/files/1252/hydrogen_roadmap_for_the_midwest_09152017.pdf

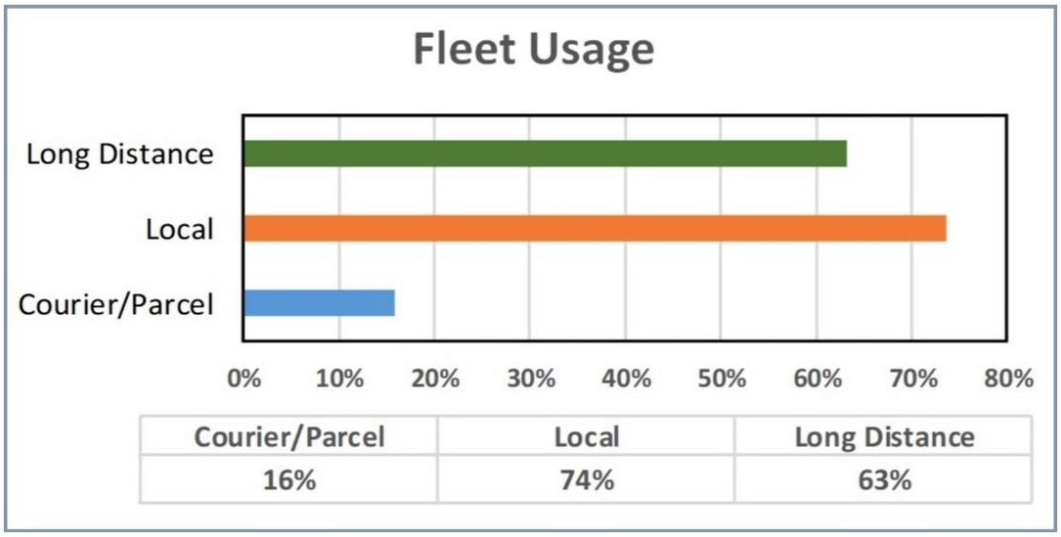
A total of 140 companies serving Ohio, the Midwest, and nationwide, were contacted via email and/or telephone to participate in this project. Twenty-two completed surveys were received and six follow-up interviews were scheduled and conducted. Ninety percent of respondents provided transport services in the Midwest, with a total of 47% being nationwide companies. To encourage company participation, survey responses have been aggregated and anonymized.

The survey was designed to obtain responses from multiple classifications of truck size, ranging from small to large-scale trucking. The respondents identified as follows:

- Light-duty/delivery fleet class – 11%
- Medium-duty class - 21%
- Heavy-duty class – 74%

With respect to the type of operations these fleets provide, three classifications were used: local (goods carried within a single metropolitan area and its adjacent non-urban areas; general same-day return trip); Long-distance (goods carried between metropolitan areas) and courier, messenger, and/or parcel carrier service.

Figure 2: Fleet Usage by Distance



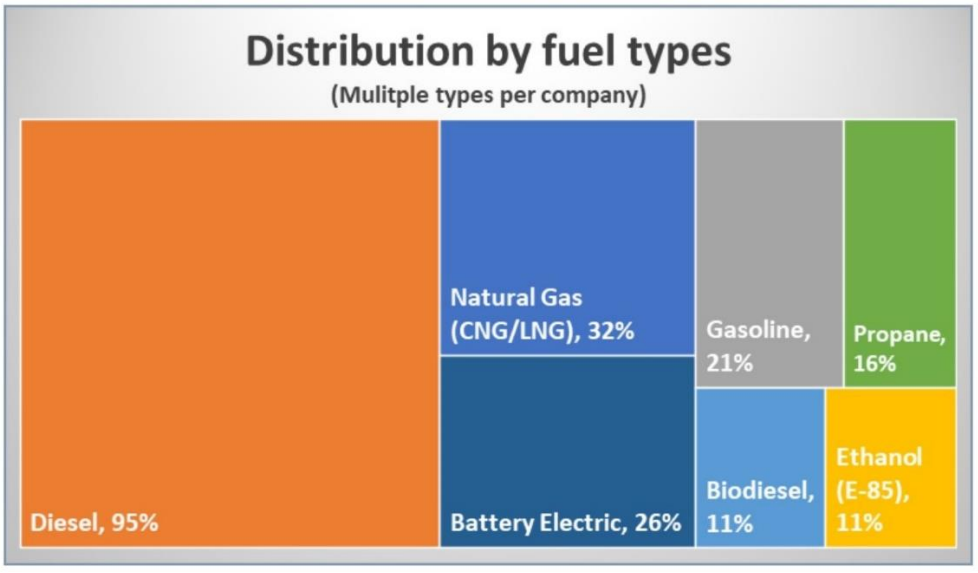
The final descriptive characteristic of the fleets surveyed detailed their fleet by fuel type.

Table 2: Number of Vehicles by Fuel Type

Fuel Type	Total vehicles using this fuel type	Percent of respondents utilizing this type of fuel
Diesel	97,767	95%
Biodiesel	12,000+	11%
Hydrogen	0	0
Gasoline	120,096	21%
Ethanol (E85)	3,150	11%
CNG/LNG	12,840	32%
Propane	1,296	16%
Battery Electric	256	26%

As indicated in the Figure 3 representation of percentages, the trucking industry continues to rely heavily on diesel fuel, followed by CNG/LNG and battery electric. There were no companies currently using hydrogen fuel cell trucks in their fleets.

Figure 3. Fleet Distribution by Fuel Types



5. RESULTS

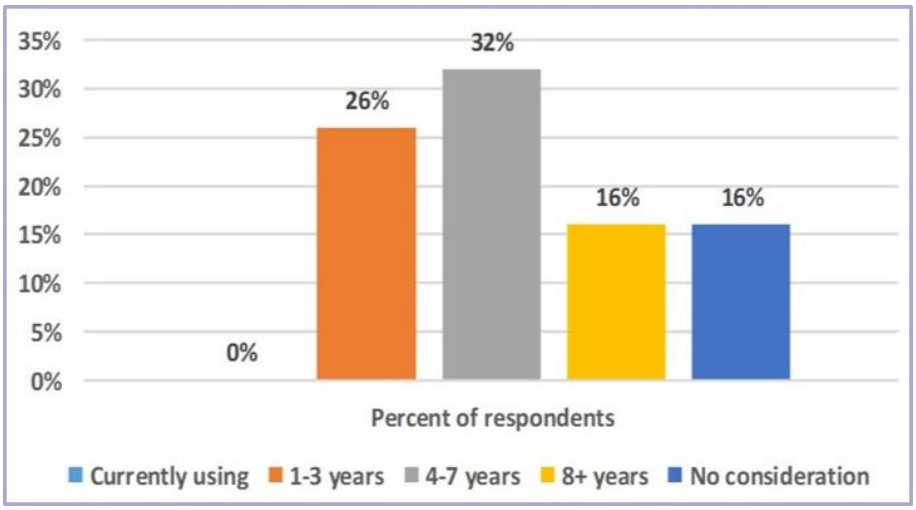
5.1 Hydrogen Fleet Usage, Deployment, and Interest

Fleets were surveyed on their current use and interest in future use of hydrogen fuel cell-powered vehicles. A number of respondents' gave the following considerations with respect to current or planned utilization of hydrogen fleets:

- A needed understanding on the true return-on-investment, actual acquisition costs, and residual value of end-of-life vehicles.
- Cost of hydrogen production and distribution, equipment purchase, maintenance expense, and energy costs.
- The low cost of gasoline and diesel; on average in the U.S. over the last year, gasoline is down $1.11/gallon and diesel is down $.73/gallon.[4]
- The comparison to traditional diesel in terms of life cycle, length, and total cost of ownership.
- Need for technology to be "proven," and level of interest customers have in supporting it.
- Corporate Social Responsibility (and sustainability) initiatives, which have become increasingly important to day-to-day operations of almost every business.

With respect to the question of whether a company would consider using hydrogen fuel cell trucks in the future, and indicate an approximate time frame, participants responded accordingly:

Figure 4: Timeframe for Consideration of Hydrogen-Powered Fuel Cell Vehicles



[4] U.S. Energy Information Administration, Gasoline and Diesel Fuel Update, April 27, 2020 https://www.eia.gov/petroleum/gasdiesel/

A surprisingly high number of companies indicated an interest in deploying fuel cell trucks in 1-3 years. However, the 4-7 year timeframe is more in keeping with the time needed to create a refueling infrastructure that can service fleets through the most commonly travelled corridors in the Midwest. This is because there are currently few publicly-available refueling stations in the Midwest, and none are located along the heavily-travelled interstate corridors.

There were a number of reasons given for delaying hydrogen consideration. Figure 5 depicts the most common reasons cited for lack of interest or hesitation in any fleet or partial transition to hydrogen. It is no surprise that lack of or limited fuel infrastructure is the most common reason.

Figure 5: Reasons for Delay or Non-Consideration of Hydrogen Fuel Cell Fleets

Given the number of concerns related to conversion to hydrogen, the majority of respondents (79%) also felt that they would dedicate only 0-25% of their fleet for hydrogen fuel cell vehicles, with five percent or less in each of the three remaining categories (25% - 50%; 50% to 75%; 75% to 100%).

5.2 Hydrogen Fleet Infrastructure

Fleets were also surveyed on the necessary hydrogen infrastructure to fuel the vehicles. Hydrogen can be generated and refueling can be done on or off premise (company-owned) or handled by a third party. If they plan to utilize fuel cell vehicles in their fleet, their preferred *infrastructure ownership* is:

- Over 50% preferred company-owned refueling sites.
- 26% preferred third-party ownership.

Only one of our respondents currently has a hydrogen station on-site. Of the remaining fleets, with reference to the question *how the hydrogen would be supplied*, they answered the following:

- 68% preferred a refueling service provider supply the hydrogen and refueling infrastructure.
- 32% would consider establishing on-site hydrogen and infrastructure to meet their needs.

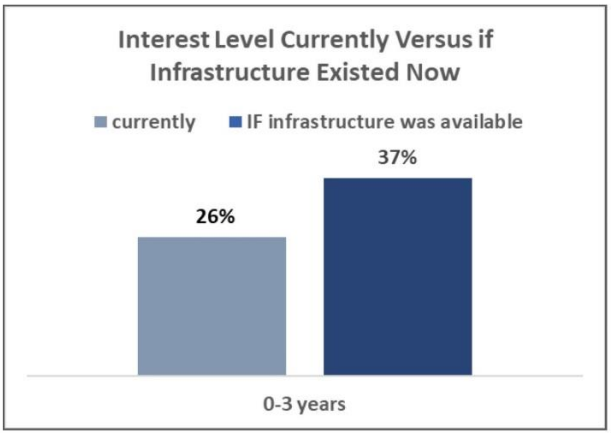
One of the areas of interest for this project is the willingness of fleets to establish collaboration with transit for potential use of infrastructure. There would be a number of outside factors such as safety, contractual obligations, etc. to contend with to allow for the greater accessibility.

Table 3: Infrastructure Accessibility

Private access (company fleet only/no public access)	21%
Limited public access (contracted dedicated fleets such as government, transit, etc.	32%
General public access	11%

In trying to gauge interest in fuel cell vehicles, we asked "*if public refueling infrastructure were available right now,"* would this create or increase their level of interest to pursue hydrogen and fuel cells? As shown in Figure 6, those who would consider hydrogen in 0-3 years (26%) versus if hydrogen refueling were available right now (37%), increased by 40%.

Figure 6: Current Level of Interest vs. if Infrastructure Were Available Now



5.3 Hydrogen Fueling and Infrastructure Providers

As indicated earlier in the Action Plan, this project included a subset of questions that were specifically directed to hydrogen fueling and infrastructure providers. In the U.S., the ratio of fleets to providers is small, and thus our pool of available providers to survey was limited. While the actual number of companies involved is small, they share a large portion of the infrastructure market. Our respondents all service the Midwest, and 75% were nationwide, with both public access (truck stops, metropolitan areas) and limited access stations (serving

dedicated fleets at their own facilities). One of the providers strictly deals with hydrogen, while the remaining 75% had the majority of diesel and gasoline fueling, with limited compressed natural gas and battery electric stations.

In surveying the providers with no current hydrogen refueling stations, we asked their timeframe for future consideration. We found that the industry is based heavily on customer demand, which are, in turn, driven by vehicle performance, proof of technology, and government offsets to constrain costs. These statements were also given as reasons for delaying the addition of hydrogen infrastructure. If the vehicles underperform relative to the customer's expectations, the customer won't want infrastructure to support them. All agreed that they would want to be on the "cutting edge" of providing hydrogen as a necessary fuel, should the market and demand warrant it.

Seventy-five percent of respondents indicated they have a deployment plan for hydrogen refueling, but they have a number of considerations in executing such a plan. These considerations include:

- Providing infrastructure for any vehicle type, matched to customer demand. Demand is monitored by the sales and customer care teams, to keep the providers in the loop about what customers' needs are or will be in the future.
- Hydrogen needs to be scaled to succeed. While the volume of hydrogen today is small, it can scale well. Demand aggregation with multiple fleets will make the scale to ramp up faster, since the infrastructure costs are similar for 20 trucks or 200 trucks. Once volume is reached, costs reductions will happen. While light-duty vehicles appear to be scaling first, regional hauling with focal refueling points will work, as will corridors for heavy-duty trucking. It is felt by respondents that dedicated freight will be more important than regional or long-haul.
- The design of the dispensing stations, ease of repair or component replacement to keep stations online, and operator training (which can take up to two years), are all important considerations.
- Regional efforts to plan and finance infrastructure will make a huge difference, as will the regional energy sources impacting how hydrogen is created.
- "Available real estate" – meaning the ability to add another type of fuel to an existing station without incurring all the costs that a new station would require. Metropolitan sites are typically smaller, and with class 8 trucking doing a pay-to-park at these stations, additional real estate for hydrogen is at a premium (although less so than it would be for battery electric, which requires hours to recharge). Rural areas provide greater flexibility for additional refueling stations. There would also have to be enough truck throughput in an area to support the hydrogen station, such as may be found along interstates.

Finally, we asked fueling providers if there was a willingness to collaborate with transit companies for use of the providers' stations. All responded favorably, and that such a

collaboration could make early adoption more economically feasible, provided the service was needed and safety could be maintained for both the provider and dedicated fleet.

6 CONCLUSIONS

The responses to the survey make clear that it isn't a question of "will" hydrogen become a mainstream fuel source for transportation, but rather "when." Transport applications for fuel cells are increasing daily, from fuel cell fork lifts (32,000 with a significant yearly increase), to buses, para-transit vehicles, and trucking. The EPA and the National Highway Traffic Safety Administration (NHTSA) have finalized Phase 2 emission standards to cover model years 2021-2027 for semi-trucks, large pickup trucks, and all types and sizes of buses and work trucks.[5] A new generation of cleaner, more fuel efficient trucks are just on the horizon, with recent announcements of joint ventures by Daimler/Volvo[6], Toyota/Kenworth[7], and Hyzon Motors, the last of which will be the first USA-based manufacturer of high-power PEM fuel cell modules for commercial vehicles beginning series production in 2020.[8]

The market for hydrogen refueling and infrastructure will increase proportionately as the industry realizes the plans already progressing and new ventures become reality. According to McKinsey & Company, the period of 2020-2025 will see enactment of policies and support for large scale deployment of medium and heavy-duty truck fueling stations (1000 by 2025) to support vehicle adoption and encourage deployment.[9] Our findings indicate that over half of our respondents would consider a potential shift in a portion of their fleet to hydrogen fuel cell

[5] U.S. EPA – *Regulations for Greenhouse Gas Emissions from Commercial Trucks and Buses*, https://www.epa.gov/regulations-emissions-vehicles-and-engines/regulations-greenhouse-gas-emissions-commercial-trucks

[6] The Volvo Group Press Release, https://www.volvogroup.com/en-en/news/2020/apr/news-3640568.html (4/21/20)

[7] Babcock, Stephane, *Kenworth, Toyota Unveil Jointly Developed Hydrogen Fuel Cell Truck* (4/22/19) https://www.truckinginfo.com/330270/toyota-and-kenworth-unveil-jointly-developed-hydrogen-fuel-cell-truck

[8] FuelCellsWorks, *Hyzon Motors Inc. is Officially Launched*… https://fuelcellsworks.com/news/hyzon-motors-inc-is-officially-launched-with-a-hydrogen-fuel-cell-heavy-vehicle-integration-facility-in-ny-state-usa/ (3/16/20)

[9] McKinsey & Co., *Road Map to a US Hydrogen Economy*, 2019, https://static1.squarespace.com/static/53ab1feee4b0bef0179a1563/t/5e7ca9d6c8fb3629d399fe0c/1585228263363/Road+Map+to+a+US+Hydrogen+Economy+Full+Report.pdf

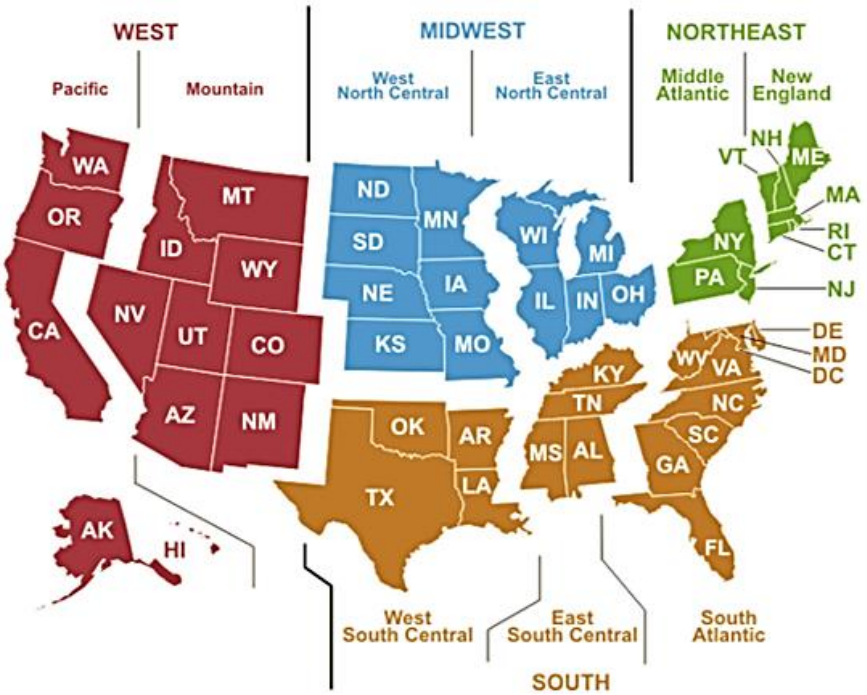
electric drive systems within the next seven years, while a quarter expect to begin deploying such trucks in the next one to three years. SARTA and other hydrogen stakeholders have proposed planning 20 alternative recharging/refueling stations in Ohio and Michigan, laying the groundwork to alleviate range anxiety, and reduce airborne and greenhouse gas emissions. The recent COVID-19 pandemic has highlighted the importance of the transition to zero-emission drive trains – a consequence of the reduced commercial activity has been a markedly improved air quality from diesel-based transportation in some of our most affected regions. This should provide an impetus to continue forward with some alacrity to develop alternative fuel and emission reduction strategies. We've now had a preview of what is possible.

7 APPENDICES

Appendix A - Fleets

Measuring interest in hydrogen fuel cell trucks

1. Where in the U.S. do you operate refueling infrastructure? (check all that apply)



- ☐ Midwest – East North Central
- ☐ Midwest – West North Central
- ☐ Northeast – Middle Atlantic
- ☐ Northeast – New England
- ☐ South – East South Central
- ☐ South – South Atlantic
- ☐ South – West South Central
- ☐ West - Mountain
- ☐ West – Pacific

2. Which one of the following best describes how your fleet vehicles are generally used?
   - ☐ Local trucking (goods carried within a single metropolitan area and it's adjacent non-urban areas; general same-day return trip)
   - ☐ Long-distance trucking (goods carried between metropolitan areas)
   - ☐ Courier, messenger, and/or parcel carrier service

3. What is the average GVWR for the majority of vehicles in your fleet?

   (Gross vehicle weight rating (GVWR) is the maximum rated weight of the vehicle and cargo, including passengers. GVWR may be applied to trucks or trailers, but not the two combined.)

   - ☐ Light duty trucks – class 1 to 3; GVWR of 0 to 14,000 lbs.
   - ☐ Medium duty trucks – class 4-6; GVWR of 14,000 to 26,000 lbs.
   - ☐ Heavy duty trucks – class 7 & 8; GVWR of 26,000 lbs. and over

4. What is the approximate number of vehicles in your fleet by fuel type:

   Diesel

   Biodiesel

   Hydrogen

   Gasoline

   Ethanol (E-85)

   Compressed/Liquefied Natural Gas (CNG/LNG)

   Propane (LPG)

   Battery Electric

5. Would your company consider using hydrogen fuel cell trucks in the future?
   - ☐ Currently using them
   - ☐ Within 1-3 years
   - ☐ Within 4-7 years
   - ☐ Possibly in 8 years or more
   - ☐ Would not consider using this type of vehicle; do not see the value

6. What are the most important reasons to delay or not consider using hydrogen fuel cell vehicles in your fleet? (select all that apply)
   - ☐ Limited fueling infrastructure
   - ☐ Concerns of acquisition costs
   - ☐ Concerns of maintenance costs
   - ☐ Concerns of vehicle's driving range or MPG fuel economy
   - ☐ Concerns of future market conditions
   - ☐ Not applicable for our operation
   - ☐ No concerns, we are planning to acquire some in the future
   - ☐ Other - please explain:

7. What percent of your fleet would you consider for hydrogen fuel cell vehicles?
   - ☐ 0-25%
   - ☐ 25% - 50%
   - ☐ 50% - 75%
   - ☐ 75% to 100%

8. If you currently use or plan to use hydrogen fuel cell vehicles in your fleet, what is your preferred ownership structure for the refueling infrastructure?
   - ☐ Owned and operated by a third party
   - ☐ Owned and operated by our company
   - ☐ Not applicable

9. Do you currently have a hydrogen refueling station on-site?

   If yes: number of hydrogen stations

   If no: ☐ We would be willing to establish on-site refueling infrastructure to meet our needs

   ☐ We prefer to have refueling service providers supply hydrogen and refueling infrastructure (i.e. Love, Pilot, Shell)

10. If you currently have or plan to have refueling infrastructure, what is your preferred access to it?
    - ☐ Accessible by our fleet only (no public access)
    - ☐ Limited public access (dedicated fleets such as government vehicles, transit buses, etc.)
    - ☐ General public access
    - ☐ Not applicable

11. *If public hydrogen refueling infrastructure were available right now*, how would it change your interest in adding fuel cell vehicles to your fleet?

    It would create or increase our interest level to pursue:

    - ☐ In 0-3 years
    - ☐ In 4-7 years
    - ☐ In 8 years or more

    ☐ It would not change our level of interest

12. Do you have any additional comments that you would like to share about using hydrogen fuel cell vehicles in your fleet?

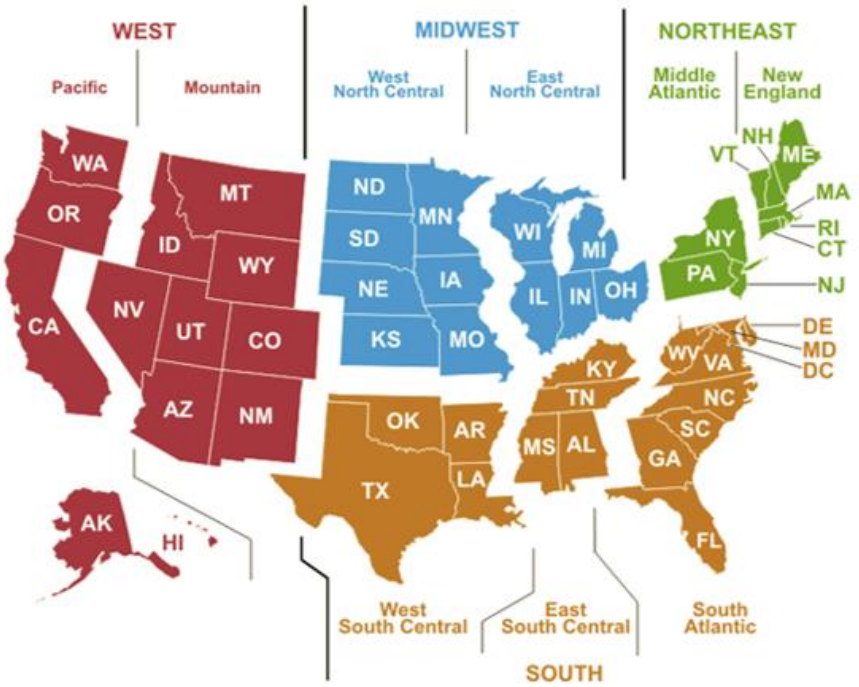
13. May we identify you and/or your company by name in our report?
    - ☐ Yes
    - ☐ No, please keep us anonymous

14. Please provide your contact information here (for our purposes only if you choose anonymity – name, company, title, email, phone).

Appendix B – Infrastructure

Measuring interest in hydrogen refueling

1. Where in the U.S. do you operate refueling infrastructure? (check all that apply)



- ☐ Midwest – East North Central
- ☐ Midwest – West North Central
- ☐ Northeast – Middle Atlantic
- ☐ Northeast – New England
- ☐ South – East South Central
- ☐ South – South Atlantic
- ☐ South – West South Central
- ☐ West - Mountain
- ☐ West – Pacific

2. Which one of the following best describes how your infrastructure is used?
   - ☐ Public access – truck stops, metropolitan areas, etc.
   - ☐ Limited access – serving dedicated fleets such as Pepsi, UPS, etc.

3. Please provide the number of stations by fuel type:
   Diesel
   Hydrogen
   Gasoline
   Compressed/Liquefied Natural Gas (CNG/LNG)
   Battery Electric

4. If you currently have no hydrogen refueling stations, would you consider providing this in the future?
   - ☐ Within 1-3 years
   - ☐ Within 4-7 years
   - ☐ Possibly in 8 years or more
   - ☐ Would not consider

5. Do you have a deployment plan in place for hydrogen stations? ☐ Yes ☐ No
   Please tell us a little about your plans:

6. What are the most important reasons to delay or not consider providing hydrogen refueling infrastructure?
   Please explain:

7. Would you consider or be willing to have collaboration with transit companies for use of your refueling station(s)? ☐ Yes ☐ No
   If no, what would prevent you from doing so?

8. Please list any additional thoughts or comments here:

9. May we identify you and/or your company by name in our report?
   - ☐ Yes
   - ☐ No, please keep us anonymous

10. Please provide your contact information here (for our purposes only if you choose anonymity – name, company, title, email, phone).