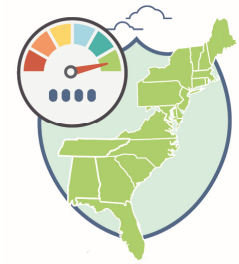

THE EASTERN TRANSPORTATION COALITION
MILEAGE-BASED USER FEE STUDY

The Eastern Transportation Coalition* Mileage-Based User Fee Study

2018 – 2019 Multi-State Truck Pilot

Final Report

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**Formerly the I-95 Corridor Coalition*

Executive Summary

The Nation's First Multi-State Truck Pilot

The trucking industry is the backbone of the nation's economy, carrying 73 percent of domestic cargo by value and over 67 percent by weight in 2018[1]. Freight carried by other modes often depends on trucking to provide access to air cargo, railroad, and seaport terminals. Nearly every sector of the economy relies on trucks to transport their goods.

Recognizing that the motor carrier industry has a vital role in the U.S. economy and is a heavy user and funder of the transportation system, the Eastern Transportation Coalition (formerly the I-95 Corridor Coalition)[2] , as part of its ongoing mileage-based user fee (MBUF) research under the U.S. Department of Transportation "Surface Transportation System Funding Alternatives" (STSFA) program, conducted the nation's first multi-state truck pilot – to bring the voice of the trucking industry into the national exploration of MBUF.

This truck pilot was crucial to the assessment of MBUF as a potential alternative approach for transportation funding for several reasons:

- Motor carriers face unique challenges and it is crucial to gain a better understanding of their needs and viewpoints.
- Commercial vehicles are not only heavy users of the transportation system, they also pay a significant amount to help build and maintain the system.
- Unlike passenger vehicles, commercial vehicles already have a long list of existing reporting requirements to comply with (e.g., International Fuel Tax Agreement (IFTA), International Registration Plan (IRP), and Electronic Logging Device (ELD) rule).

The Coalition's multi-state truck pilot explored how the MBUF concept could be applied to heavy trucks and the feasibility of using existing regulations, administrative processes, and technology as a potential MBUF framework. The truck pilot lasted 6 months from October 1, 2018 to March 31, 2019 with over 50 trucks participating and traveling more than 1,430,000 miles across 27 states. For this pilot, technology

[1] *Freight Facts and Figures*; USDOT, BTS; 2019; https://datahub.transportation.gov/stories/s/45xw-qksz

[2] The Eastern Transportation Coalition is a partnership of 17 states and D.C. focused on connecting public agencies across modes of travel to increase safety and efficiency. For over 25 years, the Coalition has brought together transportation agencies, toll authorities, public safety, and related organizations to work together to address pressing challenges. Today the Coalition represents the world's second largest economy and nearly 40 percent of the nation's gross domestic product. The Coalition provides members with the data, people, resources and tools needed to create solutions and how to get them across the finish line.

partner EROAD's system was installed as the mileage-recording device, details of which are explained in the full pilot report.

During the pilot, the Coalition collected and analyzed the truck pilot data, generating a faux statement for each of the four companies participating in the pilot. These statements included the number of participating trucks, average MPG for the pilot vehicles, number of states traveled through during the pilot, number of gallons purchased during the period, location (state) of these purchases and the, mileage driven by the fleet vehicles in each state (excluding the exemptions as per IFTA), and summary showing the estimated costs of fuel, federal fuel tax, state fuel tax and hypothetical MBUF. The statement was designed to show the fleet manager a comparison between the estimated costs under the current fuel tax system versus a potential MBUF approach.

The Coalition's STSFA grant work conducted between 2018 and 2019 established an important starting point to further engage the motor carrier industry in a constructive conversation about MBUF. The collaborative approach between the Coalition and the trucking industry will serve as the foundation for all further exploratory work aimed to ensure the unique perspective of the trucking industry is included in the national debate about potential MBUF solutions.

Pilot Lessons Learned

While further work is needed to assess the feasibility of MBUF as a sustainable transportation funding approach, five key insights were identified through the Coalition's 2018 -20919 motor carrier work:

1. Bringing the trucking industry's voice to the table is essential.

As one of the major users and payers of the transportation network, the trucking industry is a key stakeholder in the search for an alternative sustainable transportation funding approach. Given this, the Coalition made it an early priority to include trucking industry representatives in the STSFA grant work. In 2018, the Coalition established a Steering Committee comprised of key transportation stakeholders representing a range of interests and perspectives including the American Trucking Associations (ATA). The Steering Committee provided guidance and feedback on the motor carrier pilot design and focus areas.

The multi-state truck pilot also created the opportunity for companies to be directly engaged with the assessment of MBUF. Four motor carriers volunteered their staff time and vehicles to participate in the Coalition's 6-month pilot and provided input via interviews. The participating companies represented a range of fleet sizes, vehicle MPG and freight services to begin highlighting key differences in how trucks use and pay for the nation's roadways.

An important aspect of the Coalition's STSFA grant work was the establishment of a Motor Carrier Working Group (MCWG) comprised of trucking executives, association representatives and truck manufacturers to hear directly from industry stakeholders about mileage-based user fees as a potential replacement for fuel taxes. The composition of the MCWG was also intended to bring a range of

opinions about MBUF, from opposing to supporting, together. The MCWG provided suggestions for developing per-mile rates for trucks, approaches for communicating MBUF to the trucking industry, how MBUF might function within the existing regulatory framework and ideas for subsequent truck pilots.

The issues raised by the MBUF Steering Committee, the truck pilot participants, and the MCWG demonstrated the importance of bringing the trucking industry's voice to the table. The engagement of these groups is a recognition that alternatives to diesel fuel are being considered by policy makers and an indication of an interest in having the unique operating environment and perspective of the trucking industry reflected in future funding mechanisms. For policy makers to make decision about future options, current transportation funding models must be explored rigorously and informed by the industry. The Coalition will take the ideas generated and policy considerations raised by these key stakeholders and further examine them in future STSFA pilots and grant work.

2. Trucks cannot simply be treated as big cars in an MBUF system.

Beyond obvious differences in size, trucks are also much different than cars for other, less immediately apparent reasons, including how they are used, the miles they accrue, and the regulations to which they are subjected. Individual trucks on average drive more than four times as many miles per year compared to passenger vehicles and pay substantially more in fuel taxes due to lower fuel efficiencies and a higher federal diesel tax rate than gas tax rate. Trucks also pay several additional federal taxes to support the transportation network (e.g., heavy vehicle use tax, federal excise taxes, weight-mileage tax and higher tolls). In summary, when assessing the feasibility of MBUF for motor carriers, the full picture of the taxes and fees paid by the trucking industry should be taken into account.

Trucks also operate in a complex, heavily-regulated environment. Trucks serve to transport a substantial portion of the national economy through a range of business models and vehicle configurations, ownership structures and cargo characteristics. Given that trucks transport a substantial portion of the national economy while sharing the roads with the general motoring public, their business environment is highly regulated, including regulations on driver training, work hours, emissions requirements, vehicle readiness, and tax reporting. While improvements have been achieved in the past (e.g. with the establishment of IFTA and IRP), the reporting requirements are many and complex. Changes to transportation funding mechanisms should not result in adding another level of complexity or reverting from earlier improvements, like before IFTA and IRP. As a way to potentially gain support, MBUF implementation scenarios should assess ways to potentially streamline the motor carrier operating environment. The variety of uses and vehicle types and complexity of business models means that an MBUF model for the general motoring public would not translate directly to the trucking industry. Policymakers must approach MBUF in the context of the trucking industry with nuance and recognize that a one-size fits all policy will not produce palatable policy outcomes.

3. Existing regulations provide guidance for MBUF implementation.

IFTA and IRP were both developed to reduce burdensome state-by-state fuel tax and vehicle registration reporting requirements on the trucking industry; a lesson for MBUF. IFTA, as well as IRP, are excellent

examples of a national approach while still maintaining state independence on rate setting and other areas, resulting in efficiencies on the motor carrier as well as on the agency side. Overall, there is general consensus that IFTA and IRP provide a framework template for a national implementation for MBUF, that policymakers should consider. With that said, IFTA and IRP are not perfectly compatible with MBUF in their current forms. An MBUF system will require the development of data standards and more frequent reporting timelines. Also, not all commercial trucks are required to register for IFTA and IRP. In addition, policymakers should understand that IFTA and IRP are not currently set up to collect funds from motor carriers and distribute funds to states, which could be a function for them under and MBUF system or could be handled by a separate entity.

Many trucking professionals and policymakers make the immediate connection between ELD and mileage-based user fees MBUF; however, there are some key differences between the two that need to be highlighted. ELDs track a truck driver's workday to ensure compliance with federal hours of service rules and, as part of that task, only require the collection of location data at a one-hour minimum interval. In addition, ELD data (as per minimum requirements) cannot provide a distinction of mileage by states and does not cover all commercial vehicles. Given MBUF would be linked to financial transactions the ELD self-certification approach by the technology provider would need to be adjusted. For these reasons, the report concludes MBUF for commercial vehicles will require a more robust technology solution than offered by ELD functionalities alone.

4. One rate for all trucks doesn't work.

The pilot clearly showed that one-rate for all trucks doesn't work due to the vast differences in vehicle operations, types, ages, performance and mileage travelled. Rates for the pilot were set based on each Coalition state's diesel tax and an assumed average fuel efficiency of 6 MPG. This rate was designed to be neither an increase nor decrease in tax revenue for the collecting agency, or "revenue neutral." However, three of the four fleets involved in the pilot had average MPG values less than 6 MPG, resulting in a net MBUF credit (i.e., the MBUF amount charged was less than state fuel tax paid). At first, these differences may not seem large, but multiplied over a company's fleet, the costs add up quickly. For example, one company in the pilot had 40 vehicles with an average MPG of 3.42. If the per-mile MBUF rate was to be set using the national MPG average, this company would receive a rebate of over $68,000 per year in state fuel taxes. The company with the most fuel-efficient fleet was under the MBUF based on 6 MPG, and would be asked to pay a penalty of over $1,400 for its five fuel efficient trucks. In other words, one MBUF rate across all trucks would create a situation where fuel inefficient fleets would be rewarded and fuel-efficient fleets would be penalized.

As was shown in the pilot data, motor carriers in different sectors of trucking and different terrain produce different average fuel efficiencies. For instance, drayage trucks operating in an urban, short haul environment will likely not see the same efficiencies as companies that accrue more highway miles. The MCWG suggested several key attributes including age of truck, vehicle class, weight, fuel efficiency. The Coalition will work with industry stakeholders on how to explore MBUF rate setting in future truck pilots. In summary, rate setting will be much more complicated than for passenger vehicles.

5. Further need for education and outreach.

Education about MBUF is a dialogue. Sharing the pilots results and highlighting key differences between trucks and passenger cars helps reduce misinformation about motor carriers and will help the industry craft an acceptable approach to MBUF that considers their interests. The future transportation funding solution cannot be solely on the shoulders of motor carriers, as this approach is inconsistent with the "user pays for what they use" principle. Beyond the Coalition's MBUF activities related to trucking, the Coalition's passenger vehicle pilots also serve to educate the general public about the need for sustainable transportation funding to build and maintain the transportation system, which is a shared goal of the trucking industry. With this pilot work, the Coalition is equipping policymakers with data-driven, industry-informed analysis to make pragmatic decisions on the viability of MBUF.

Need for Further Research

The first Multi-State Truck pilot provided valuable insights and identified the need for further research to answer the question if a MBUF is a sustainable future funding solution. The 2020 STSFA grant activities for the Coalition MBUF effort will include a broader multi-state truck pilot with 200 tractor-trailers traveling through the lower 48 contiguous United States, making it the largest mileage-based user fee truck pilot conducted in North America. The 2020 truck pilot will build off the lessons learned from the Coalition's STSFA grant activities and closely analyze rate-setting by developing per-mile rates for each state, examining weight-based variable rates and applying multiple rate structures for background analyses. The pilot will also explore proofs of concept about how to use MBUF technology to incorporate existing tolls and MBUF into an integrated driver statement to further study operational efficiencies that could be achieved.

In addition to the pilot, STSFA grant activities will include expanded education and outreach activities. These activities will target commercial vehicles and motor carriers, discussing how MBUF potentially could help provide a more sustainable funding source for transportation and the potential MBUF approaches. The Coalition will continue its ongoing outreach to the trucking industry including the MCWG to present findings and hear feedback on ways to improve the research and further address policy questions.

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Acronyms and Abbreviations

ATA	American Trucking Associations
ATRI	American Transportation Research Institute
BTS	Bureau of Transportation Statistics
CBO	Congressional Budget Office
Coalition	The Eastern Transportation Coalition (*formerly I-95 Corridor Coalition*)
Ehubo	EROAD's On-Board Unit
ELD	Electronic Logging Device
EPA	United States Environmental Protection Agency
FET	federal excise taxes
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
GPS	global positioning system
GVWR	gross vehicle weight rating
HOS	Hours of Service
HTF	Highway Trust Fund
IFTA	International Fuel Tax Agreement
IRP	International Registration Plan
MBUF	mileage-based user fee
MCWG	Motor Carrier Working Group
MPG	miles per gallon
NHTSA	National Highway Traffic Safety Administration
OBU	on-board unit
RODS	record of duty status
RUC	Road User Charge
STSFA	Surface Transportation System Funding Alternatives
U.S.	United States
USDOT	United States Department of Transportation
VMT	vehicle miles traveled

1 Introduction

The Eastern Transportation Coalition (*formerly the I-95 Corridor Coalition*)[3] is focused on expanding the understanding of why investing in transportation is important and why there is a need for sustainable transportation funding. One option being explored in the United States (U.S.) is the potential to replace the fuel tax with a mileage-based user fee (MBUF). The Coalition recognizes that it is vital to bring the unique perspectives of both the eastern seaboard as well as the trucking industry to the national evaluation of MBUF, so they applied for and received funding through the U.S. Department of Transportation (USDOT) "Surface Transportation System Funding Alternatives" (STSFA) program. The purpose of the Coalition's grant work is to explore the feasibility of replacing the fuel tax with a MBUF in a multi-state environment. Understanding that the roadways are used for a variety of purposes, the Coalition has conducted demonstration pilots focused on both passenger and commercial vehicles.

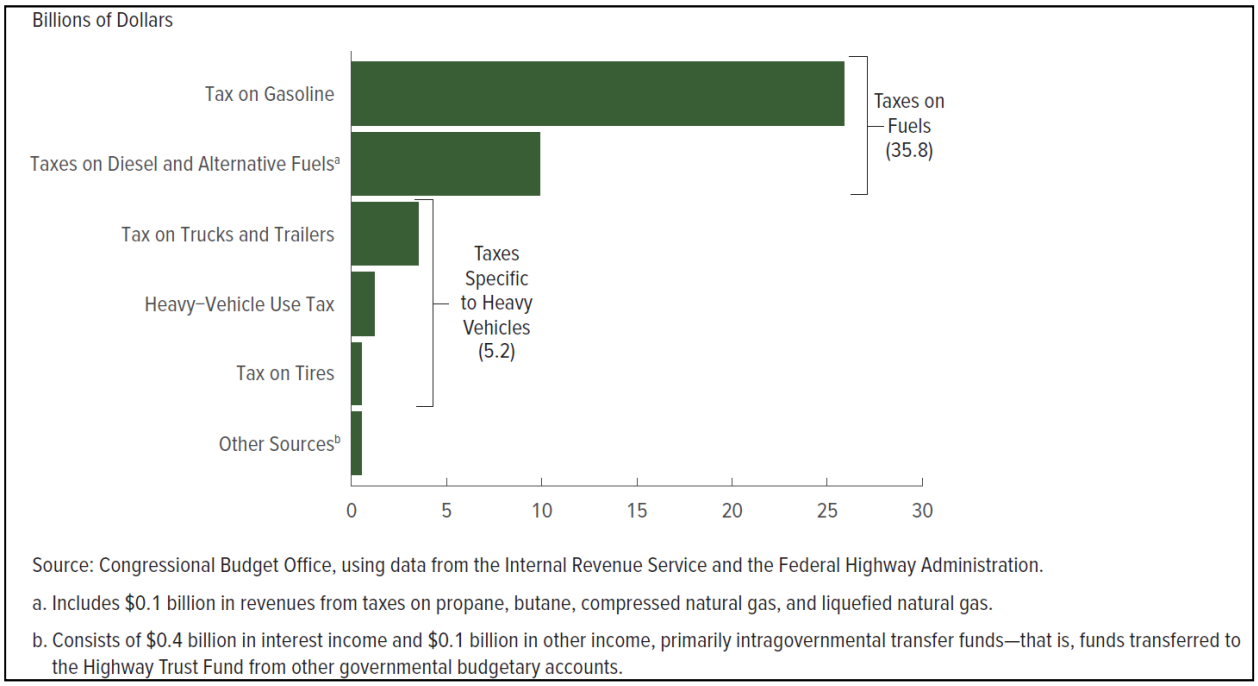
This report summarizes the results of the nation's first multi-state MBUF truck pilot and associated investigations conducted by the Coalition as part of USDOT STSFA program. The overall vision of the Coalition's STSFA activities – as stated in the grant application – is *"to gain an understanding of the foundation necessary for a viable mileage-based approach for funding transportation improvements that would enable a smooth transition from the current fuel tax to a more sustainable and user-based funding source."* Moreover, the Coalition work places this vision in the context of traveling through multiple states, the distinct attributes of the eastern seaboard, and the operating environment of the trucking industry. The Coalition representing transportation agencies along the eastern seaboard believes exploring the feasibility of an MBUF solution is important; for now, however, the Coalition is neutral if MBUF is the ultimate solution.

1.1 The Need for Sustainable Transportation Funding

State and federal fuel taxes that are part of the transaction when purchasing gasoline or diesel fuel at the pump are the primary source of funding for constructing, maintaining, and operating the non-tolled roadways and bridges that make up the national transportation systems. Another key source of funding is various taxes on heavy vehicles as shown on Figure 1-1.

[3] The Eastern Transportation Coalition is a partnership of 17 states and D.C. focused on connecting public agencies across modes of travel to increase safety and efficiency. For over 25 years, the Coalition has brought together transportation agencies, toll authorities, public safety, and related organizations to work together to address pressing challenges. Today the Coalition represents the world's second largest economy and nearly 40 percent of the nation's gross domestic product. The Coalition provides members with the data, people, resources and tools needed to create solutions and how to get them across the finish line.

Figure 1-1. Sources of Revenues Credited to the Highway Trust Fund, 2017



Source: Congressional Budget Office, using data from the Internal Revenue Service and the Federal Highway Administration.

a. Includes $0.1 billion in revenues from taxes on propane, butane, compressed natural gas, and liquefied natural gas.

b. Consists of $0.4 billion in interest income and $0.1 billion in other income, primarily intragovernmental transfer funds—that is, funds transferred to the Highway Trust Fund from other governmental budgetary accounts.

A problem with fuel taxes being a primary source of transportation funding is that the purchasing power of pay-at-the-pump fuel tax revenues has been eroding over the past two decades. A primary cause is inflation. For example, the federal diesel tax, currently at 24.4 cents per gallon, is worth only 13.35 cents in 2020 dollars[4]. State fuel taxes have been increased in 31 states since 2013, some with variable rates and annual indexing. However, even these adjusted state fuel taxes are not keeping pace with the increasing highway construction costs that have more than doubled (a 131 percent increase[5]) over the last 25 years.

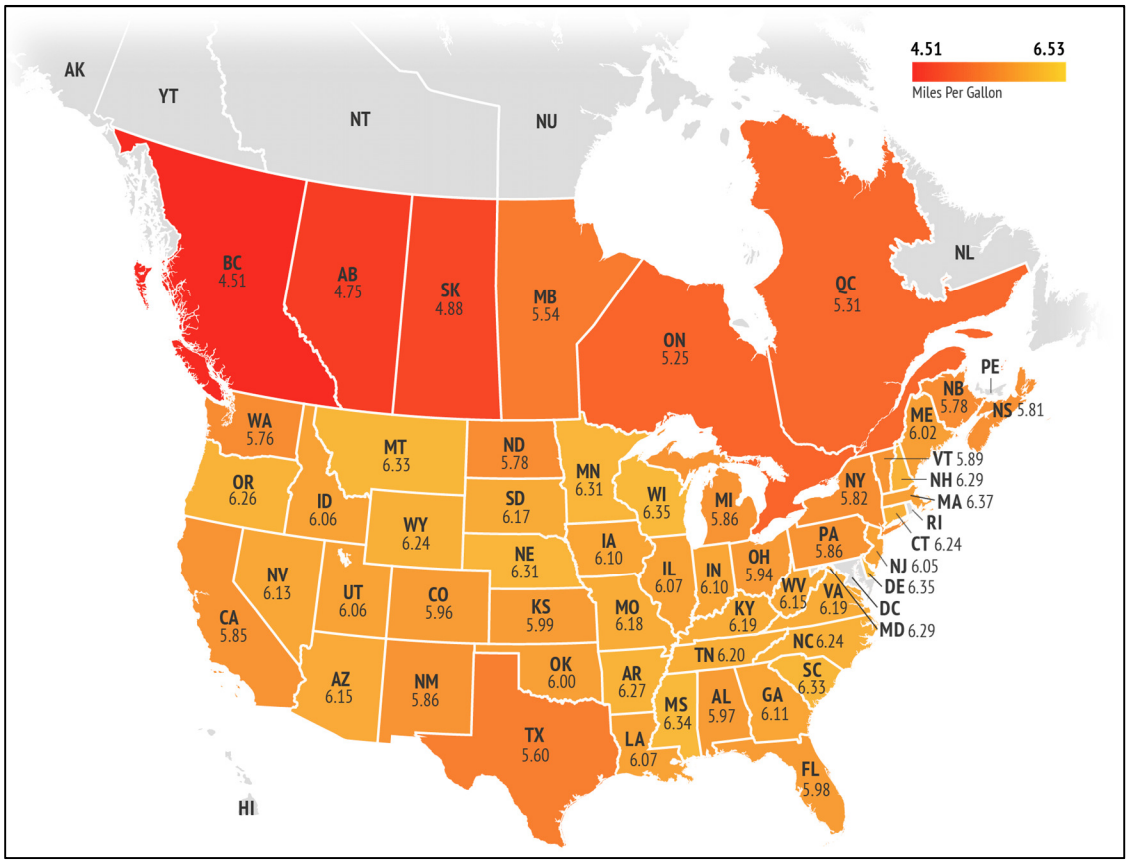
A second issue affecting transportation funding is improved vehicle fuel efficiency. The national average miles per gallon (MPG) for combination trucks (i.e., semis) has remained between 5 and 6 MPG since 1985 (see Figure 1-2). However, these averages are likely to change with medium- and heavy-duty trucks beginning to face fuel-economy standards. The U.S. Environmental Protection Agency (EPA) and the National Highway Traffic Safety Administration (NHTSA) jointly issued emissions and fuel efficiency standards for medium- and heavy-duty vehicles in 2011. These "Phase 1" standards applied to vehicles of model years 2014 through 2018, requiring total fuel consumption reduction levels of 10 to 23 percent for combination trailers. In 2016, NHTSA and EPA jointly issued final "Phase 2" fuel efficiency and

[4] CPI Inflation Calculator; Bureau of Labor Statistics; Accessed June 25, 2020; https://data.bls.gov/cgi-bin/cpicalc.pl.

[5] "An Unhappy Anniversary: Federal Gas Tax Reaches 25 Years of Stagnation;" Institute on Taxation and Economic Policy (ITEP); September 25, 2018; https://itep.org/an-unhappy-anniversary-federal-gas-tax-reaches-25-years-of-stagnation/.

emission standards for medium- and heavy-duty vehicles for model years 2018-2027 that make fuel consumption rates for vehicles of model year 2018 and beyond increasingly more efficient than required by the 2011 standards. Relative to the Phase 1 baseline, the Phase 2 standards, if fully implemented, are projected to achieve vehicle fuel savings as high as 25 percent, depending on the vehicle category.[6]

Figure 1-2. Average Miles per Gallon for Heavy Trucks (Class 7 and 8)



Source: "The State of Fuel Economy in Trucking;" Geotab; https://www.geotab.com/truck-mpg-benchmark/; Accessed April 29, 2019.

An analysis conducted by the Union of Concerned Scientists in 2015[7] showed that the proposed standards would result in a 21 to 33 percent reduction in fuel consumption for new combination trucks

[6] "Corporate Average Fuel Economy;" NHTSA; https://www.nhtsa.gov/laws-regulations/corporate-average-fuel-economy; Accessed April 29, 2019.

7 "Newly Proposed Heavy-Duty Truck Efficiency Standards for 2018-2029;" Union of Concerned Scientists; 2015; https://www.ucsusa.org/sites/default/files/attach/2015/07/proposed-heavy-duty-vehicles-standards.pdf

in 2027. The Energy Information Administration[8] estimates that by 2040 the average fuel economy of new medium- and heavy-duty vehicles across all regulated classes would reach 10.6 MPG gasoline equivalent, representing a 33 percent improvement.

Besides changes in fuel-economy standards, improving fuel efficiency is also an important business parameter for trucking companies in terms of remaining profitable and cost competitive. A recent American Transportation Research Institute (ATRI) survey[9] indicates that in terms of average marginal costs per mile, fuel costs are the second largest expense for carriers behind driver wages. Across all sectors of trucking in 2018, fuel costs were $0.433 per mile, equivalent to 24 percent of total average marginal cost. Fuel costs, and their associated taxes, are a major cost for motor carriers, which means motor carriers have a strong business incentive to pursue fuel efficiency. Motor carriers with the means to do so attempt to bring down fuel costs by purchasing newer tractors (although these purchases of heavy trucks and trailers are subject to the federal excise tax [FET] on retail truck sales), investing in trailer wings and skirts to reduce drag, installing speed governors on trucks, and incentivizing drivers to avoid hard braking or accelerating incidents. In addition to these existing investments, the trucking industry is investing in and researching technologies like adaptive cruise control, truck platooning, mirrorless trucks, and alternative fuels.

A third issue affecting transportation funding is a changing fleet composition. Per ATRI, electric vehicles make up approximately 1 to 3.8 percent of truck fleets. However, a review of summaries prepared by a number of market research firms indicates that the number could grow over the next few years. As an example, Technavio[10] predicts a global year-over-year growth rate in electric trucks of 25.7 percent, with most of this growth occurring in the Asia-Pacific region. The actual growth in electric trucks will, of course, depend on several factors, such as availability of charging infrastructure and government subsidies and incentives. The dramatic increase in e-commerce has increased local truck trips and “last mile” deliveries. Local delivery fleets are ideal for electrification given their predictable routes and significant dwell times at the depot — important factors when planning for recharging, particularly in terms of making overnight recharging of electric trucks much more feasible and making electric trucks more viable. As such, electric trucks (as well as alternative-fueled trucks) will be increasingly used in the local delivery market, with companies such as FedEx, UPS, and Amazon committed to the ordering of electric delivery vans. It is feasible that local delivery fleets in the U.S. may have competitive electric

8 “Proposed standards for medium- and heavy-duty vehicles would reduce diesel consumption;” Energy Information Administration; June 27, 2016; https://www.eia.gov/todayinenergy/detail.php?id=26832.

9 “An Analysis of the Operational Costs of Trucking: 2019 Update;” ATRI; November 2019; https://truckingresearch.org/wp-content/uploads/2019/11/ATRI-Operational-Costs-of-Trucking-2019-1.pdf.

10 “Global Electric Trucks Market 2020-2024 | Presence of Government Initiatives and Availability of Subsidies to Boost the Market Growth | Technavio;” Business Wire; January 24, 2020; https://www.businesswire.com/news/home/20200124005120/en/Global-Electric-Trucks-Market%C2%A02020-2024-Presence-Government-Initiatives.

truck options within the next few years.[11] As is the case with most decisions in the commercial vehicle market, the potential move to electric delivery vehicles will be based on cost. Per a study conducted by the Workhorse Group[12] electric vehicle energy costs 35 percent of what diesel costs last-mile delivery fleets. The growth in electric trucks will directly affect transportation funding as less fuel taxes will be collected. If electric trucks are shown to be viable and cost-effective with the necessary charging infrastructure in place, the conversion of the motor carrier fleet could occur more rapidly compared to passenger vehicles. A faster change in fleet composition would be driven by economic incentives (lowering operating and maintenance costs) coupled with the fact that truck tractors are replaced on average every 7 years[13].

The combined effect of improved fuel efficiency and a changing fleet composition, would render a transportation system dependent on fuel taxes to be no longer be viable. Take for example, three scenarios that calculate fuel tax from trucks through 2036 using Bureau of Transportation Statistics (BTS) statistics and Federal Highway Administration (FHWA) projections in annual vehicle miles traveled (VMT):

- A – Average fuel economy of all trucks = 6.5 MPG
- B – Average fuel economy of all trucks = 8.4 MPG (a 30 percent increase in existing MPG in accordance with the range identified for the Phase 2 NHTSA standards discussed above.)
- C – Average fuel economy of all trucks =13 MPG (a doubling of the existing MPG, assuming that much of the motor carrier fleet includes electric trucks).

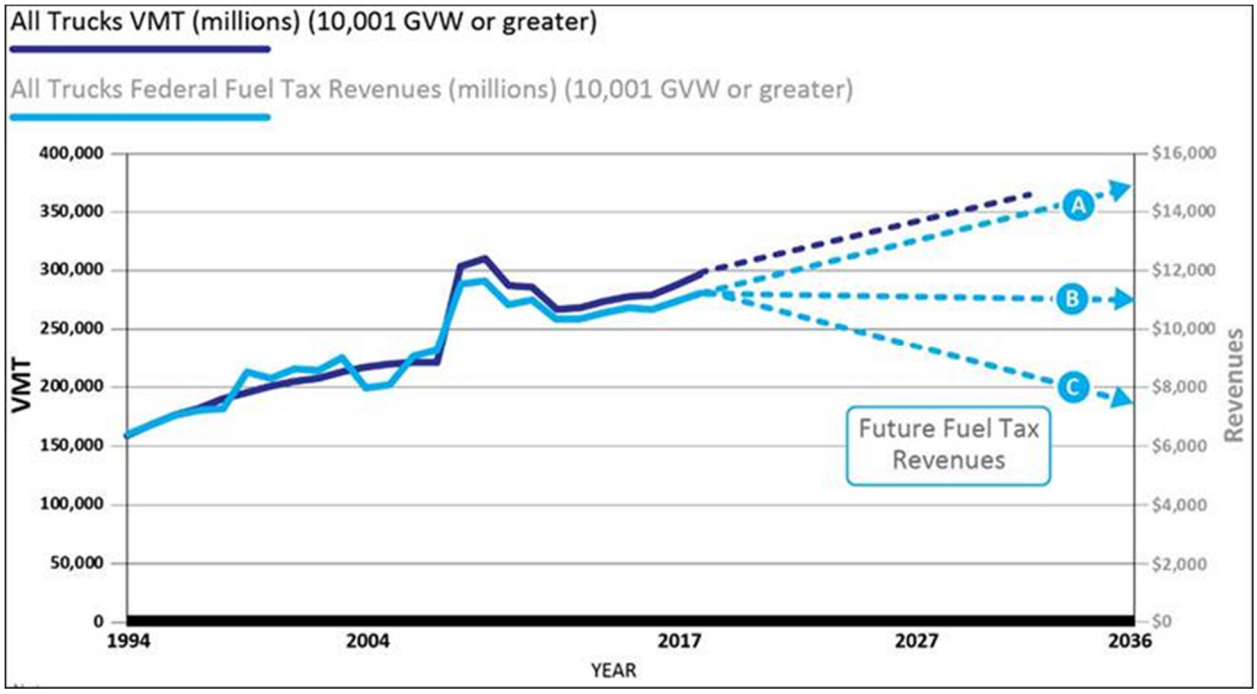
These calculations assume growth of 1.5 percent between 2017 and 2037 and that all trucks greater than 10,000 gross vehicle weight rating (GVWR) use diesel fuel and pay the current federal diesel tax of 24.2 cents per gallon. The results are shown on Figure 1-2.

11 “Electric package trucks are (almost) ready for delivery;” Jason Mathers, GreenBiz; March 10, 2020; https://www.greenbiz.com/article/electric-package-trucks-are-almost-ready-delivery.

12 “Electric last-mile delivery could save industry $540M this season;” Josh Fisher, FleetOwner; November 30, 2017; https://www.fleetowner.com/news/economics/article/21701543/electric-lastmile-delivery-could-save-industry-540m-this-season.

13 Per the ATRI survey, truck tractors are replaced on average every 7 years. A “truck tractor” is the power-unit designed to draw/pull a semi-trailer.

Figure 1-2. Projected Federal Fuel Tax Revenues from Trucks Under Various Scenarios

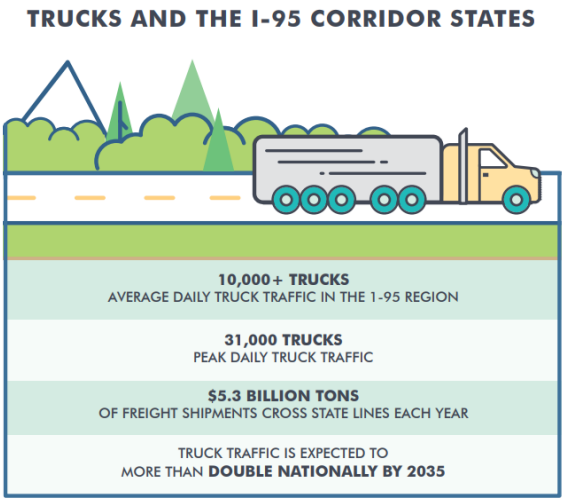


The difference in revenues between 2017 and 2036 (Scenario A) is 2.2 percent, in line with the Congressional Budget Office (CBO) projection that annual revenues credited to the Highway Trust Fund (HTF) from the diesel fuel tax will fall by 2 percent[14]. The difference in revenues in 2036 between Scenarios A and B is 3.35 billion, a 22 percent reduction in potential revenues. However, should electric semis become viable in the next few years (Scenario C), the potential reduction in fuel tax revenues becomes significantly worse.

In summary, while the number of miles driven is expected to increase in the U.S., fewer gallons of fuel will likely be sold due to improved fuel economy and a changing fleet, with a corresponding decrease in revenues from fuel taxes. Combined with inflation, the net effect is that the revenues collected to pay for roadway maintenance, repair, and operations will continue on a steady decline. Having less money to maintain and manage roadways means that the transportation system will continue to worsen each year, while the amount of demand on the network increases.

[14] "Issues and Options for a Tax on Vehicle Miles Traveled by Commercial Trucks"; CBO; October 17, 2019; https://www.cbo.gov/publication/55688.

Having less transportation funding directly affects the motor carrier industry. Increasing demand on the roadway network, coupled with roadway events (e.g., crashes, disabled vehicles caused by hitting potholes), cause congestion that involves significant cost delays to trucking and other vehicles. A 2018 report by ATRI[15] indicates that, in 2016, the trucking industry experienced nearly 1.2 billion hours of delay on the National Highway System as a result of traffic congestion. This delay is the equivalent of 425,533 commercial truck drivers sitting idle for an entire working year. Applying ATRI's national average operational cost per hour calculation of $63.66 for 2016, it is estimated that the additional operational costs incurred by the trucking industry due to traffic congestion were $74.5 billion, an average congestion cost per truck of $6,478.



1.2 Alternative Funding Approach: Mileage-Based User Fees

Recognizing the concerns with the fuel tax as a long-term sustainable funding source for transportation, the U.S. Congress established the STSFA Program under Section 6020 of the Fixing America's Surface Transportation Act (FAST Act) passed in 2015. The STSFA Program authorized up to $95 million in federal grant dollars over a 5-year period. The purpose of the STSFA program is to provide grants to state departments of transportation—with a 50 percent match requirement—to conduct demonstration projects that explore user-based alternative revenue mechanisms. The goal of these projects is to assess potential approaches that can help maintain the long-term solvency of the HTF. The goals associated with the STSFA funding include:

- Test the design, acceptance, and implementation of two or more future user-based alternative revenue mechanisms.
- Improve the functionality of such user-based alternative revenue mechanisms.
- Conduct outreach to increase public awareness regarding the need for alternative funding sources for surface transportation programs and provide information on possible approaches.
- Provide recommendations regarding adoption and implementation of user-based alternative revenue mechanisms.

[15] "Cost of Congestion to the Trucking Industry: 2018 Update;" ATRI; October 2018; https://truckingresearch.org/wp-content/uploads/2018/10/ATRI-Cost-of-Congestion-to-the-Trucking-Industry-2018-Update-10-2018.pdf.

- Minimize the administrative cost of any potential user-based alternative revenue mechanisms.

An MBUF is one example of an alternative transportation revenue mechanism. MBUF charges drivers a fee for their road use based on miles driven rather than fuel consumed. The original intent of the fuel tax was to be a usage fee and it worked well when vehicles got essentially the same average MPG. Today, vehicles no longer have the same fuel efficiency and these differences will only grow larger over time. A new sustainable transportation funding approach is needed.

The Coalition was awarded STSFA grant funds to explore the feasibility of replacing the fuel tax with an MBUF approach in a multi-state environment. This work brings the voices of motor carriers and other drivers along the eastern seaboard into the critical national discussion of how to establish a sustainable transportation funding approach. The focus areas of the Coalition's work include:

- **Out of State Mileage:** How will travel across state boundaries be managed?
- **Tolling:** What are potential synergies between tolling and MBUF?
- **Amenities:** Will value-added amenities, or premium features, help with public acceptance of MBUF by drivers and vehicle owners?
- **Trucking:** How would a user fee fit into the unique operating environment, viewpoints, and regulatory requirements of the motor carrier industry?

The Coalition members want to promote a better understanding of why investing in transportation is important and why the current fuel tax does not provide a long-term sustainable solution in this regard. The Coalition, representing transportation agencies along the eastern seaboard, believes **exploring the feasibility of an MBUF solution is important; but for now, however, the Coalition and its partners are neutral if MBUF is the ultimate solution.** The activities under the STSFA grants—including the multi-state truck pilot — are part of the broader effort to explore the feasibility of a potential MBUF solution and to provide a better understanding of how MBUF might work.

1.3 Commercial Regulations and MBUF

Commercial vehicles are subject to numerous regulations. Three, in particular, involve the collection of mileage information in some manner and were therefore examined as part of the Coalition's MBUF work: the International Fuel Tax Agreement (IFTA), the International Registration Plan (IRP), and the Electronic Logging Device (ELD) rule. Appendix A contains data requirements associated with these three motor carrier regulations.

1.3.1 International Fuel Tax Agreement

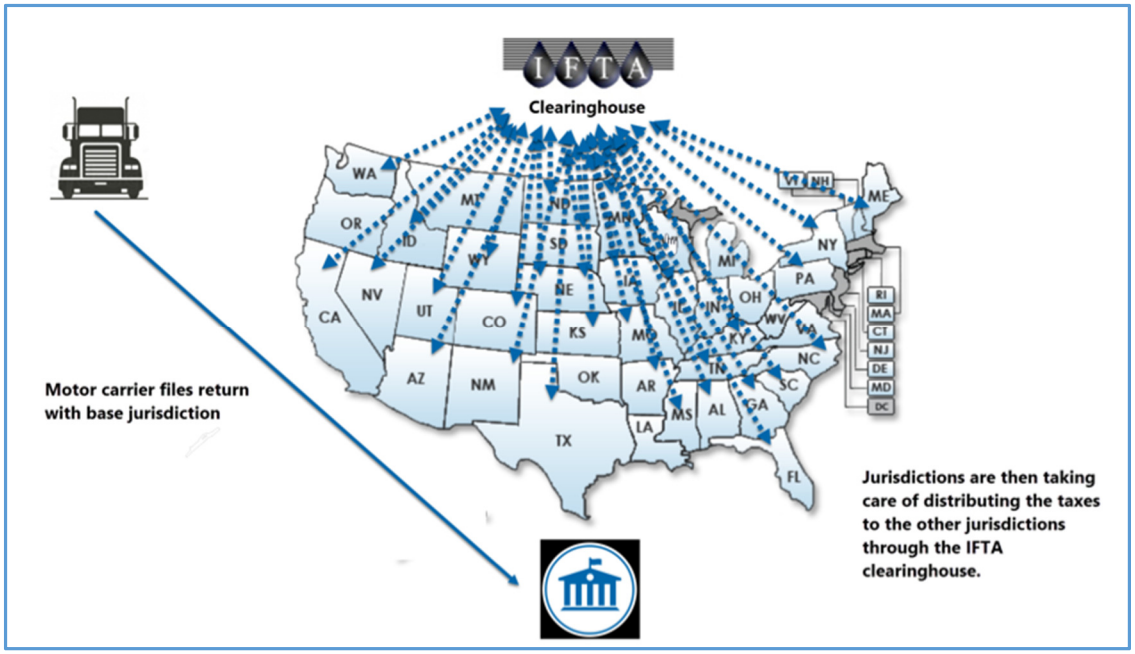
IFTA is an agreement between the lower 48 states in the U.S. and 10 Canadian provinces to simplify the reporting of fuel taxes by interstate motor carriers. IFTA was set up as a nationwide approach for reporting information and fairly distributing state fuel taxes between states, thereby replacing the non-

uniform requirements of state-level systems that were becoming intolerably expensive and burdensome to motor carriers.

Commercial trucking companies must register if they have an established place of business in the state from which motor carrier operations are performed, if they accrue mileage in that state, and if they operate in at least one other IFTA jurisdiction. In addition to travel in at least two IFTA jurisdictions, the vehicles must weigh over 26,000 pounds, or have three or more axles on the power unit. Under IFTA, commercial fleets are issued an IFTA license and one set of state IFTA decals for their trucks, which will allow the fleet's trucks to operate in all other IFTA jurisdictions without buying additional decals from those jurisdictions. Some vehicles are exempted from IFTA as defined by each jurisdiction.

The establishment of IFTA brought several advantages to interstate motor carriers, including a single fuel tax license authorizing their vehicles to travel in all member jurisdictions, plus a single tax return filed each quarter with the jurisdiction where they are licensed. These returns contain mileage and fuel use information for all member jurisdictions. IFTA provides several functions, including managing a clearinghouse and reconciliation process that exchanges data and funds among IFTA jurisdictions, making sure that each state and province receives motor fuel taxes reflecting the use of their roads by interstate trucks. Jurisdictions are basically acting as an agent for each other, collecting tax from their carriers and distributing taxes to the other jurisdictions. The process is illustrated on Figure 4-2.

Figure 4-2. IFTA Clearinghouse Process for Distributing State Fuel Taxes for Motor Carriers



1.3.2 International Registration Plan

IRP is a registration reciprocity agreement between 48 states in the U.S. and 10 Canadian provinces which has similar clearinghouse and fund distribution functions as IFTA, but with a focus on registration fees between states and provinces based on the percentage of mileage driven in each state or province.

Similar to IFTA, IRP applies to heavy commercial vehicles of 26,000-pound GVWR or above and vehicles with three or more axles operating in multiple states. Vehicles of lesser weight may also be included. For-hire heavy vehicles used for the transportation of persons (i.e., buses) must also register under IRP.

Registration fees are apportioned between states and provinces based on the percentage of miles traveled in each state or province compared to the total miles traveled, and the IRP clearinghouse distributes the registration revenues among member jurisdictions. Registrants under IRP are required to file annual reports to their base jurisdiction reporting miles driven in each jurisdiction.

IRP collects data on a 12-month schedule, rather than the quarterly reporting under IFTA. IRP and IFTA hold joint workshops on auditing, management and law enforcement. There is no coordination between the two organizations, however, regarding collection of mileage data for each motor carrier. Individual states have access to mileage data from each motor carrier from both IRP and IFTA and can compare reported mileage from motor carriers, although not all states do this because of differences in the set-up of the state's tax administration. States can also conduct joint audits.

1.3.3 Electronic Logging Device Rule

Federal hours of service (HOS) regulations issued by the Federal Motor Carrier Safety Administration (FMCSA) govern the working hours of commercial motor vehicle drivers in the U.S. These regulations limit the number of daily and weekly hours spent driving and working, and the minimum amount of time drivers must spend resting between driving shifts. Beginning December 18, 2017, FMCSA mandates that all interstate carriers and drivers operating commercial motor vehicles over 10,000 pounds requiring record of duty status (RODS) that were not equipped with automatic on-board recording devices (AOBRDs), use an ELD. By December 17, 2019, all interstate drivers of commercial vehicles were required to use ELDs. As a result of the FMCSA rule, the method of RODS was transformed from a paper to an electronic process. The main rationale was to reduce falsification and enhance the integrity of RODS for reducing driver fatigue on the highways. Essentially, it was a safety and compliance initiative rather than a highway infrastructure initiative to mandate ELDs. Not all trucks and drivers are subject to the ELD rules.

ELDs are self-certified and must be registered with FMCSA. The FMCSA maintains a list of ELDs that currently includes more than 450 models. Some ELD technologies – such as offered by technology partner EROAD – also support compliance with the IFTA and IRP regulations and provide other value-added services.

1.4 Review of International Experience

A well-established example of an MBUF system that focuses primarily on trucks with multiple rates is the New Zealand Road User Charges (RUC) system. One of the key drivers in developing the mileage-based RUC system was the ability to adjust revenue from road taxation to match maintenance and other road expenditure attributable to heavy vehicles. This approach ensures that each type of vehicle is taxed according to the costs it imposes on the roadway network system, thus making the user-pays principle more evident in the financing of road construction and road maintenance. Two groups of vehicles are required to pay RUC:

- All diesel-powered vehicles and other vehicles powered by a fuel not taxed at the source regardless of weight. This includes light duty or passenger cars powered by diesel.
- All vehicles with a manufacturer's gross laden weight of more than 3.5 tons (7,716 pounds). The actual per-mile rates are dependent on vehicle weight, configuration, and number of axles.

The New Zealand RUC approach is also being examined as part of the Coalition's work, as it has proven valuable to learn from international experience. A notable aspect is also that the industry has been heavily involved in modernization of the system, including the establishment of a costs allocation model, which has resulted in increased support of the system. While international experience has to be taken with a grain of salt, in particular learning from what did not work, and why, can be beneficial.

Additional information on the New Zealand RUC system is provided in Appendix B.

2 Nation's First Multi-State MBUF Truck Pilot

The motor carrier industry is the backbone of the nation's economy, carrying 73 percent of domestic cargo by value and over 67 percent by weight in 2018[16]. Freight carried by other modes often depends on trucking to provide access to air cargo, railroad, and seaport terminals. Nearly every sector of the economy relies on trucks to transport their goods.

Trucking contributed $288.2 billion to the nation's gross domestic product in 2016, the largest of any freight transportation mode[17]. Although trucks account for only 14 percent of vehicle miles traveled on our roads, the trucking industry currently covers approximately 45 percent of the HTF through the commercial truck diesel and gas tax and other trucking-specific excise taxes[18].

Recognizing that the motor carrier industry has a vital role in the U.S. economy and is a heavy user and funder of the transportation system, the Coalition conducted a multi-state truck pilot – ***the first in the nation*** – to bring the voice of the trucking industry into the national exploration of MBUF. This truck pilot was crucial to the assessment of MBUF as a potential alternative approach for transportation funding for several reasons:

- Motor carriers face unique challenges and it is crucial to gain a better understanding of their needs and viewpoints.
- Commercial vehicles are not only heavy users of the transportation system, they also pay a significant amount to help build and maintain the system.
- Unlike passenger vehicles, commercial vehicles already have a long list of existing reporting requirements with associated administrative processes to comply with (e.g., ELD, IFTA, and IRP).

2.1 Overview of the Multi-State Truck Pilot

The multi-state truck pilot lasted 6 months from October 1, 2018 to March 31, 2019 with over 50 trucks participating. The Coalition's multi-state truck pilot explored how the MBUF concept could be applied to heavy trucks and the feasibility of using existing regulations, administrative processes, and technology as

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[16] *Freight Facts and Figures*; USDOT, BTS; 2019; https://datahub.transportation.gov/stories/s/45xw-qksz.

17 Freight Facts and Figures; USDOT, BTS; 2019; https://datahub.transportation.gov/stories/s/45xw-qksz.

18 "America's truckers challenge policymakers to support bold infrastructure plan;" American Trucking Associations; January 24, 2018; https://www.bulktransporter.com/regulations/article/21657004/americas-truckers-challenge-policymakers-to-support-bold-infrastructure-plan

a potential MBUF framework. The pilot was intended to establish a starting point to further engage the motor carrier industry in a constructive conversation about MBUF. The collaborative approach between the Coalition and the trucking industry will serve as the foundation for all further exploratory work aimed to ensure the unique perspective of the trucking industry is included in the national debate about potential MBUF solutions.

2.1.1 Technology Partner

The truck pilot used a system provided by EROAD, one of the Coalition's technology partners. The core element of EROAD's system is the secure on-board unit (OBU, also called Ehubo) which collects data to provide regulatory and commercial services, including: HOS, ELD, electronic IFTA, and IRP record keeping, electronic Weight-Mileage Tax reporting (e.g., Oregon), and to provide trucking companies with tools to monitor driver performance and improve fleet management, thereby enhancing safety and operations. The same data collected by EROAD can also be used to measure and collect MBUF. The OBU uses a combination of internal and external sensors to measure the distance the vehicle travels, and to capture location (e.g. state) and route, including global positioning system (GPS) satellites and inertial sensors.

Figure 2-1. EROAD In-Vehicle Device

The vehicle data captured from the hardware is transmitted by a secure cellular link to a web-based platform where it is processed to calculate and prepare records and reports, such as IFTA, and MBUF charges. An in-vehicle device (Figure 2-1) is installed in the cab of the truck to provide information to the driver and by which the driver may change their duty status or vehicle configuration. Appendix C provides more detailed information on the EROAD system.

2.1.2 MBUF Per-Mile Calculation

MBUF per-mile rates were developed for each Coalition state using the average fuel efficiency for trucks and each state's state diesel tax rate. These per-mile rates were developed to be "revenue neutral", meaning that a truck getting the national average MPG would pay the same amount of MBUF as paid in state diesel tax. Table 2-1 shows the national average for trucks is about 6 MPG, which was used in the calculations for the initial per-mile rate calculations.

Table 2-1. Average Truck MPG

Typical Operating Weight	MPG
Less than 20,000 pounds	6.4
20,001 to 40,000 pounds	6.6
40,001 to 60,000 pounds	6.6
60,0001 to 80,000 pounds	6.3
Greater than 80,000 pounds	5.5
Average	6.3

Source: "An Analysis of the Operational Costs of Trucking: 2019 Update;" American Transportation Research Institute; November 2019.

The per-mile rates for each Coalition state as well as the diesel fuel tax rates (provided as a credit against the MBUF) are shown in Table 2-2. The EROAD system measures the number of miles driven in each state, by road type and by each equipped truck. This mileage information was used to calculate the MBUF for each Coalition state in which the truck was driven using the per-mile rates shown in Table 2-2.

Table 2-2. Per Mile Rates Used in the Multi-State Truck Pilot (Based on Average 6 MPG)

State	Per Mile Rate (cents per mile)	Diesel Excise Tax (cents per gallon)
Connecticut	7.32	43.09
Delaware	3.67	22.00
District of Columbia	4.00	23.50
Florida	5.73	34.97
Georgia	5.00	40.07
Maine	5.20	31.20
Maryland	5.76	36.05
Massachusetts	4.00	26.54
New Hampshire	3.70	23.83
New Jersey	7.37	48.50
New York	6.53	44.61
North Carolina	5.85	36.45

Table 2-2. Per Mile Rates Used in the Multi-State Truck Pilot (Based on Average 6 MPG)

State	Per Mile Rate (cents per mile)	Diesel Excise Tax (cents per gallon)
Pennsylvania	12.35	75.20
Rhode Island	5.50	34.00
South Carolina	3.33	20.75
Vermont	5.17	32.00
Virginia	3.37	24.71

Source: "State Motor Fuel Taxes Effective Jan 1, 2019;" American Petroleum Institute

2.1.3 Pilot Operations

EROAD was responsible for identifying commercial fleet participants and enrolling them in the pilot (including the installation of the EROAD hardware and associated training). The criteria for the participants were that they were IFTA registrants, headquartered in one of the Coalition states, represent a range of fleet sizes, covered a variety of carrier types and traveled across state lines. Class 7 (26,001 to 33,000 pounds) and Class 8 (33,001 pounds and over) trucks from four fleet operators were included in the pilot, as summarized in Table 2-3. The companies recruited for the pilot provided warehousing and distribution, waste and disposal services, and cargo and freight services. The number of trucks varied between 39 and 59 from month to month, with an average of 55 per month.

Table 2-3. Summary of MBUF Truck Pilot Participants

Carrier	Business Location	Number of Vehicles
A	New Jersey	40
B	North Carolina	10
C	Connecticut	5
D	Maine	5

Note: In accordance with the privacy provisions, the names of individual carriers are not identified.

The selected fleet owners signed a participation agreement (Appendix D) addressing such items as the length of the pilot, EROAD's responsibilities, carrier's responsibilities, and EROAD's rights and liabilities. Data privacy is also addressed in the agreement, noting that any information provided to the Coalition and the project team will be anonymized, and that only quarterly summaries of miles traveled by jurisdiction and by carrier will be provided. All personally identifiable information (PII) collected solely for the purposes of the pilot was destroyed within 60 days of the completion of the Project. Additionally,

to present MBUF as a value-added amenity, the pilot carriers had access to the full suite of EROAD's fleet management and compliance solutions as described in Appendix C.

During the pilot, EROAD collected and analyzed the truck pilot data, generating a faux statement for each of the four companies participating in the pilot. These statements included the number of participating trucks, average MPG for the pilot vehicles, number of states traveled through during the pilot, number of gallons purchased during the period, location (state) of these purchases and the, mileage driven by the fleet vehicles in each state (excluding the exemptions as per IFTA), and summary showing the estimated costs of fuel, federal fuel tax, state fuel tax and hypothetical MBUF. The statement was designed to show the fleet manager a comparison between the estimated costs under the current fuel tax system versus a potential MBUF approach. The statement also had the following disclaimer:

> **The Eastern Transportation Coalition members and EROAD want to promote a better understanding of why investing in transportation is important, and why the current fuel tax does not provide a long-term and equitable solution in this regard. The Coalition, representing transportation agencies along the entire eastern seaboard, and EROAD believes exploring the feasibility of a MBUF solution is important; for now, however, the Coalition and EROAD are neutral if MBUF is the ultimate solution.**

As discussed in the next section, the statement was subsequently modified to include two different sets of per-mile rates – one based on an average 6 MPG as noted above, and another set of per-mile rates based on the average MPG of the actual trucks participating in the pilot (4.1 MPG). A 6-month statement was created showing the results for both rates. A copy of one of these statements is provided in Appendix E.

2.2 Pilot Results

During the 6-month pilot, an average of 55 participating trucks each month accumulated 1.43 million miles across 27 states (Figure 2-2). Of the 1.43 million miles driven, 1.34 million miles were accrued in the Coalition states. Table 2-4 shows the number of "billable miles" driven in each Coalition state by the four carriers during the 6-month pilot. Billable miles represent the total number of miles driven less any distance exempt as per IFTA rules.

Figure 2-2. States Where Mileage Was Accrued During the Truck Pilot

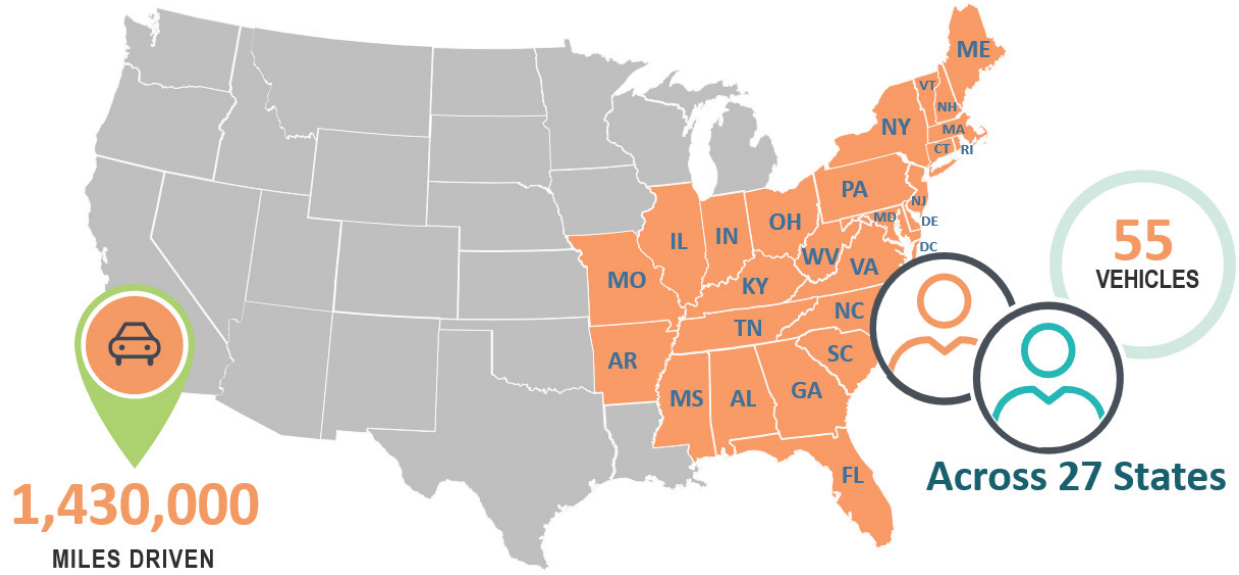


Table 2-4. Billable Miles Driven in Coalition States During the Truck MBUF Pilot

State	Carrier A	Carrier B	Carrier C	Carrier D	Total
Connecticut	44,080	5,497	74,987	46,871	171,435
Delaware	2,354	6,587	0	107	9,048
District of Columbia	1	36	0	0	37
Florida	0	1,542	0	0	1,542
Georgia	0	1,134	0	0	1,134
Maine	2,907	671	0	72,510	76,088
Maryland	3,591	27,164	0	614	31,369
Massachusetts	5,004	2,716	6,712	37,496	51,928
New Hampshire	714	601	43	8,816	10,173
New Jersey	362,815	16,158	27,837	24,848	431,658
New York	66,663	5,565	12,186	24,580	108,994
North Carolina	2,326	115,226	0	0	117,552
Pennsylvania	81,941	38,445	0	57,487	177,873

Table 2-4. Billable Miles Driven in Coalition States During the Truck MBUF Pilot

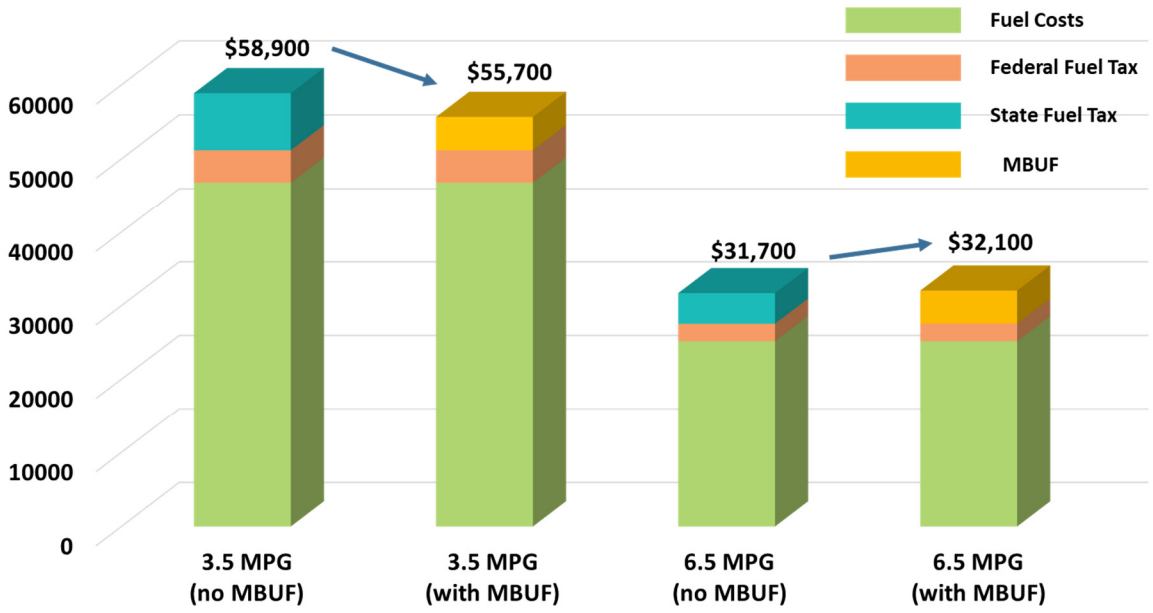
State	Carrier A	Carrier B	Carrier C	Carrier D	Total
Rhode Island	256	98	248	584	1,186
South Carolina	0	46,834	0	0	46,834
Vermont	618	303	0	0	921
Virginia	4,437	75,483	0	33	79,953
TOTAL	577,705	344,059	122,013	273,945	1,317,722

Note: The number of billable miles equals the total miles for each Coalition state except Massachusetts, where miles driven on toll facilities are exempted from the IFTA calculations. Similarly, these exempted miles driven by the pilot trucks in Massachusetts (i.e., 20,375 miles) were not charged MBUF either.

Cells highlighted in yellow indicate states where each carrier is headquartered (and also represents the state with the greatest number of miles driven for each carrier).

A key question to be answered during the 6-month pilot was: what would be the financial effect on a trucking company if the nation shifted from a fuel tax to MBUF? The preliminary results of the pilot clearly found that using the average national MPG (6) would generate rebates for fuel inefficient vehicles and would penalize companies with more fuel-efficient fleets. Figure 2-3 compares two trucks: one with 3.5 MPG and one with 6.5 MPG. Assuming each truck drives 63,000 miles per year, the fuel inefficient truck would receive a "rebate" of $3,200 and the fuel-efficient truck would be required to pay a "penalty" of $400. At first, these differences may not seem large, but multiplied over a company's fleet, the costs add up quickly. For example, one company (Carrier A) in the pilot had 40 vehicles with an average MPG of 3.42. If the per-mile MBUF rate was to be set using the national MPG average, this company would receive a rebate of over $68,000 per year in state fuel taxes. The company with the most fuel-efficient fleet was Carrier D, and under the MBUF based on 6 MPG, they would be asked to pay a penalty of over $1,400 for its five fuel-efficient trucks.

Figure 2-3. Total Annual Costs for a Truck with and without MBUF



Note: Based on an MBUF Rate of 7.1 cents/mile (based on average 6.0 MPG) and 63,000 annual miles.

The intention of the pilot was to set a "revenue-neutral" MBUF rate (meaning the participating company would pay the same amount of MBUF as paid in state diesel taxes), the MBUF per-miles rates were therefore recalculated using the average fuel efficiency for all the pilot trucks: 4.1 MPG (see Table 2-5). The 6-month statements were adjusted to show the gross and net MBUF for both the 6 and 4.1 MPG values.

Table 2-5. Updated Per Mile Rates Used in the Multi-State Truck Pilot

State	Per Mile Rate 6 MPG (cents per mile)	Per Mile Rate 4.1 MPG (cents per mile)	Diesel Excise Tax * (Fuel Tax Credit) (cents per gallon)
Connecticut	7.32	10.71	43.09
Delaware	3.67	5.37	22.00
District of Columbia	4.00	5.73	24.00
Florida	5.73	7.88	34.37
Georgia	5.00	7.34	30.00
Maine	5.20	7.61	31.20
Maryland	5.76	8.79	34.55

Table 2-5. Updated Per Mile Rates Used in the Multi-State Truck Pilot

State	Per Mile Rate 6 MPG (cents per mile)	Per Mile Rate 4.1 MPG (cents per mile)	Diesel Excise Tax * (Fuel Tax Credit) (cents per gallon)
Massachusetts	4.00	5.85	24.00
New Hampshire	3.70	5.81	22.20
New Jersey	7.37	11.83	44.20
New York	6.53	10.88	39.15
North Carolina	5.85	8.89	35.10
Pennsylvania	12.35	18.07	74.10
Rhode Island	5.50	8.29	33.00
South Carolina	3.33	5.06	20.00
Vermont	5.17	7.80	31.00
Virginia	3.37	5.78	20.20

* Per the Diesel Forum (https://www.dieselforum.org/about-clean-diesel/trucking), in 2018, 75% of all commercial vehicles (weight classes 3 to 8) were diesel powered, with 97% of class 8 big rig trucks being diesel-powered. In the U.S., a small percentage of cars (3%) and pickups (13%) are also diesel-powered. For the purpose of Coalition MBUF analyses and truck pilots, it is generally assumed that all trucks greater than 10,001 pounds GVWR use diesel, and the remaining vehicles (except buses) use internal combustion engines powered by gas.

The overall data from the pilot are shown in Table 2-6. The table highlights how fleets with lower fuel efficiency are paying for more fuel on a per mile basis (e.g., Carrier C paid 0.73 per mile and Carrier D paid 0.41 cents per mile). The same relationship holds for the state and federal fuel taxes with the more inefficient fleet paying more fuel taxes per mile. Under the MBUF scenarios, the payment for using the transportation system shifts from the efficiency of the vehicle to how many miles are driven. The result is the per-mile cost is basically equal across the four participating fleets. The difference in MBUF paid by each carrier is dependent on the number of vehicles participating in the pilot and the number of miles those vehicles drove. However, looking at the pilot costs for the MBUF (6 MPG) versus MBUF (4.1 MPG) continues to show how the MBUF rate can create incentives or disincentives to investing in a fuel-efficient fleet.

The total column in Table 2-6 shows the net revenue effect of shifting from a state fuel tax to an MBUF. Under the MBUF scenario based on 4.1 MPG, there is only a $187 difference while under the MBUF based on 6 MPG, there would be a net revenue loss of $45,218. The lower revenue under the MBUF 6 MPG scenario is mainly due to the larger number of miles driven by Carrier A which had a lower MPG (3.42) than the national 6 MPG average. In other words, for the pilot environment only, less revenue

would be generated under MBUF. Granted, the pilot vehicles do not represent the national truck fleet, but they do highlight the importance of MBUF rate setting.

Table 2-6. Summary of Truck Pilot Data

Description	Carrier A	Carrier B	Carrier C	Carrier D	Total
Number Trucks in Pilot	40	10	5	5	60
Average MPG	3.42	4.74	3.62	6.33	4.1
Number of States Traveled	16	27	6	16	27
Miles Driven	578,760	344,660	132,280	282,390	1,338,090
Billable Miles	577,710	344,060	122,010	273,950	1,317,720
Gallons of Fuel	169,230	72,730	36,540	44,590	323,090
Fuel Costs	$444,060	$183,350	$96,170	$117,020	840,590
Fuel Cost per Mile	$0.77	$0.53	$0.73	$0.41	$0.63
Federal Fuel Tax	$41,290	$17,750	$8,920	$10,880	$78,840
State Fuel Tax	$79,770	$24,960	$14,960	$18,920	$138,600
MBUF (@ 6 MPG)	$45,440	$19,690	$8,620	$19,640	$93,390
Net MBUF (6 MPG)	($34,320)	($5,270)	($6,340)	$720	($45,220)
MBUF (@ 4.1 MPG)	$67,870	$29,980	$12,450	$28,120	$138,420
Net MBUF (4.1 MPG)	($11,890)	$5,020	($2,510)	$9,200	($190)

Notes:

Miles Driven includes all miles driven in Coalition states. This does not include the 91,910 miles driven outside the Coalition states, for a total number of 1.43 million miles driven during the pilot.

Billable Miles includes all miles driven in Coalition states less any IFTA-exempted miles.

Gallons of fuel used is estimated based on average fleet MPG.

Estimated fuel costs are estimated based on the state monthly prices, exclusive of state and federal taxes, sourced from the U.S. Energy Information Administration.

Fuel taxes paid estimated based on gallons of fuel used and the federal and individual state fuel taxes on diesel.

MBUF is calculated as follows: billable miles per state × per-mile rate in each state.

A net MBUF value in parenthesis represents a net credit to the carrier.

All numbers are rounded to the nearest ten excluding Number of Trucks, Average MPG, Number of States Traveled, and Fuel Cost per Mile.

3 Key Insights

The Coalition's 2018-2019 Multi-State Truck pilot started the exploration of how existing regulations, agency processes and technology could function as a potential framework of a MBUF approach. While further work is needed to assess the feasibility of MBUF as a sustainable transportation funding approach, five key insights were identified through the Coalition's multi-state pilot:

1) Bringing the trucking industry's voice to the table is essential.
2) Trucks cannot simply be treated as big cars in an MBUF system.
3) Existing regulations provide guidance for MBUF implementation.
4) One rate for all trucks doesn't work.
5) Further education and communication is necessary.

3.1 Bringing the Trucking Industry's Voice to the Table is Essential

As one of the major users and payers of the transportation network, the trucking industry is a key stakeholder in the search for an alternative sustainable transportation funding approach. Given this, the Coalition made it an early priority to include trucking industry representatives in the STSFA grant work. In 2018, the Coalition established Steering Committee comprised of key transportation stakeholders representing a range of interests and perspectives including the American Trucking Associations (ATA; see Appendix F). The Steering Committee provided guidance and feedback on the pilot design and focus areas.

The multi-state truck pilot also created the opportunity for companies to be directly engaged with the assessment of MBUF. As was described in Section 2, four motor carriers volunteered their staff time and vehicles to participate in the Coalition's 6-month pilot. The truck-focused pilot brought to the surface the operational differences between trucks and cars, the additional excise taxes, the regulatory and reporting environment in which commercial vehicles must function within, and other unique challenges the trucking industry faces. The participating companies represented a range of fleet sizes, vehicle MPG and freight services to begin highlighting key differences in how trucks use and pay for the nation's roadways.

Interviews were conducted with several of the truck pilot participants. In these conversations, it became clear that there is a need to communicate to the trucking industry what MBUF is all about, what distinguishes MBUF from other fees (e.g., Oregon weight and distance tax) and why the current transportation funding approach is not viable. Unlike the passenger vehicle pilots where data privacy concerns are typically raised as major barriers, there were mixed reactions to data privacy which could be linked to the trucking industry already being subject to numerous data reporting requirements. There

was, however, agreement on the importance of keeping collected data secure and ensuring compliance. Another clear message from the interviews was to keep MBUF simple (if implemented). For example, unlike MBUF for passenger vehicles, MBUF for motor carriers would need to be implemented on a fleet basis similar to IFTA. Future Coalition pilots will continue to recruit a range of trucking companies (e.g., with different fleet size, fleet age, fleet MPG, travel footprint, and freight services provided). The Coalition's truck pilot showed, like other pilots around the country, that pilots are an essential way to engage with key stakeholders and expand the understanding of what MBUF implementation might entail by giving people first-hand experience with how MBUF might work in real life.

Another key aspect of the Coalition's focus on bringing the trucking voice into the exploration of MBUF, was the launch of a working group of motor carrier stakeholders.

3.1.1 Motor Carrier Working Group

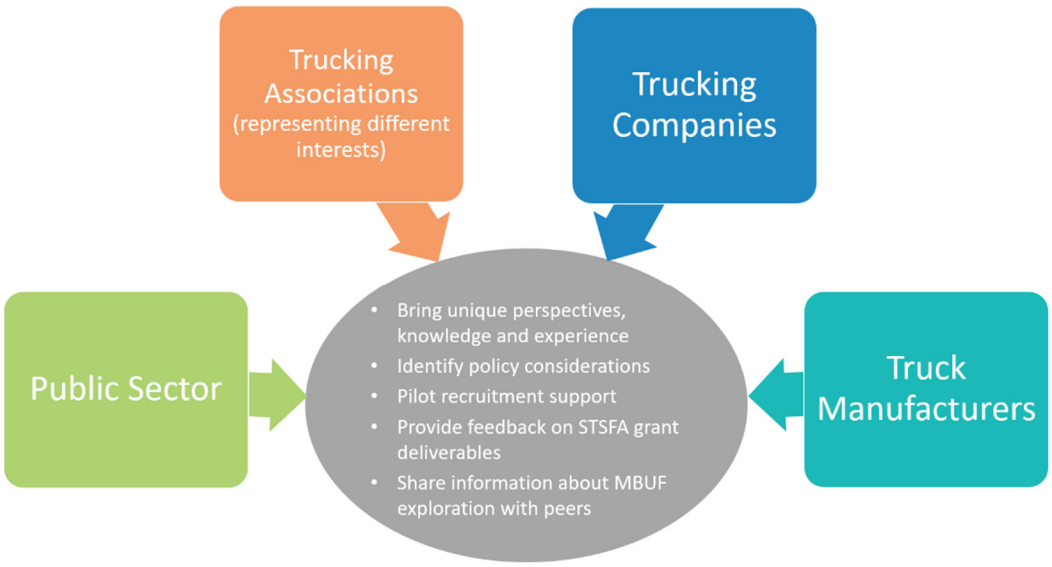
In 2019, the Coalition formed a Motor Carrier Working Group (MCWG) to bring varying viewpoints, concerns, and recommendations to the assessment of MBUF. Recruitment of members was based on input from the MBUF Steering Committee, EROAD network of contacts and the Coalition's long history of working with the trucking industry. The Coalition Freight Program Director, relying on her 30-plus years of experience and the creation of the Coalition's Freight Academy (a comprehensive 1-week immersion program for agency personnel focused on goods movement to ground future public-sector decisions and investments in an understanding of the comprehensive supply chain), helped identify and recruit a mix of members. The composition of the MCWG was also intended to bring a range of opinions about MBUF, from opposing to supporting, together. The resulting MCWG included representatives from trucking associations, individual carriers (of varying size), truck manufacturers, and major users of commercial vehicles for moving goods across the nation. Members also include state departments of transportation and regulatory entities (see Figure 3-1). The names of individual members and discussions held during meetings remains confidential given the sensitive nature of changing how transportation is funded.

The first MCWG meeting was held in September 2019 to provide an overview of MBUF, the 2018 and the 2019 Coalition passenger vehicle pilots and the Coalition's multi-state truck pilot. However, the majority of the meeting was dedicated to a discussion about the reasons to support or oppose the MBUF concept, the basis for developing per-mile rates for trucks, approaches for communicating MBUF to the trucking industry, how MBUF might function within the existing regulatory framework (e.g., IFTA, IRP, and ELD), and ideas for subsequent truck pilots. Some highlights from the meeting are listed below:

- MBUF should be assessed because transportation revenue is not keeping up with infrastructure needs.
- MBUF is considered a more attractive future option compared to tolling.
- MBUF cannot add additional layers of complexity.

- Implementation would need to reflect that motor carriers manage fleets.
- Concern exists for potentially high administrative costs of MBUF.
- Rate setting must be done in a transparent manner by elected officials.
- Attributes to consider in rates setting include age of truck, vehicle class, weight, and fuel efficiency.
- Limiting MBUF to interstates seems contrary to the purpose of MBUF—to have users of the transportation system pay for they use (regardless of where).
- Further discussion about a congestion surcharge is warranted (e.g., will surcharge enable drivers to avoid congestion or simply add to the cost of freight movement?).
- National compliance and enforcement framework will be needed.
- Standards and certifications for system providers will be needed.
- MBUF data security, privacy, and ownership standards will be needed.
- Dedicating MBUF revenue to transportation will help with motor carrier support.
- Expand the number of motor carriers participating in pilots.
- Educational material is needed to explain MBUF and why the trucking industry should be engaged in this national discussion.

Figure 3-1. MBUF Motor Carrier Working Group



The discussion also raised concern about any manual reporting given this would be prone to major compliance issues and increased enforcement and auditing efforts by states. With more and more technology readily available from several vendors, the sentiment of the working group is that a shift to MBUF could increase reliance on automated and secure in-vehicle technologies. Even though automation reduces the cost and time required by drivers and fleet managers to input information and increase the accuracy of that information, there are upfront costs to these technologies that could be difficult for motor carriers. If an MBUF is to be nationally required, the initial cost to the industry to comply will need to be considered.

The issues raised by the MBUF Steering Committee, the truck pilot participants, and the MCWG demonstrated the importance of bringing the trucking industry's voice to the table. The engagement of these groups is a recognition that alternatives to diesel fuel are being considered by policy makers and an indication of an interest in having the unique operating environment and perspective of the trucking industry reflected in future funding mechanisms. For policy makers to make decision about future options, current transportation funding models must be explored rigorously and informed by the industry. The Coalition will take the ideas generated and policy considerations raised by these key stakeholders and further examine them in future STSFA pilots and grant work.

3.2 Trucks Cannot Simply be Treated as Big Cars in an MBUF System

Beyond obvious differences in size, trucks are also much different than cars for other, less immediately apparent reasons, including how many miles they accrue, how much they pay to use the roads, what they are used for, and the regulations to which they are subjected.

3.2.1 Trucks are Heavy Users and Payers

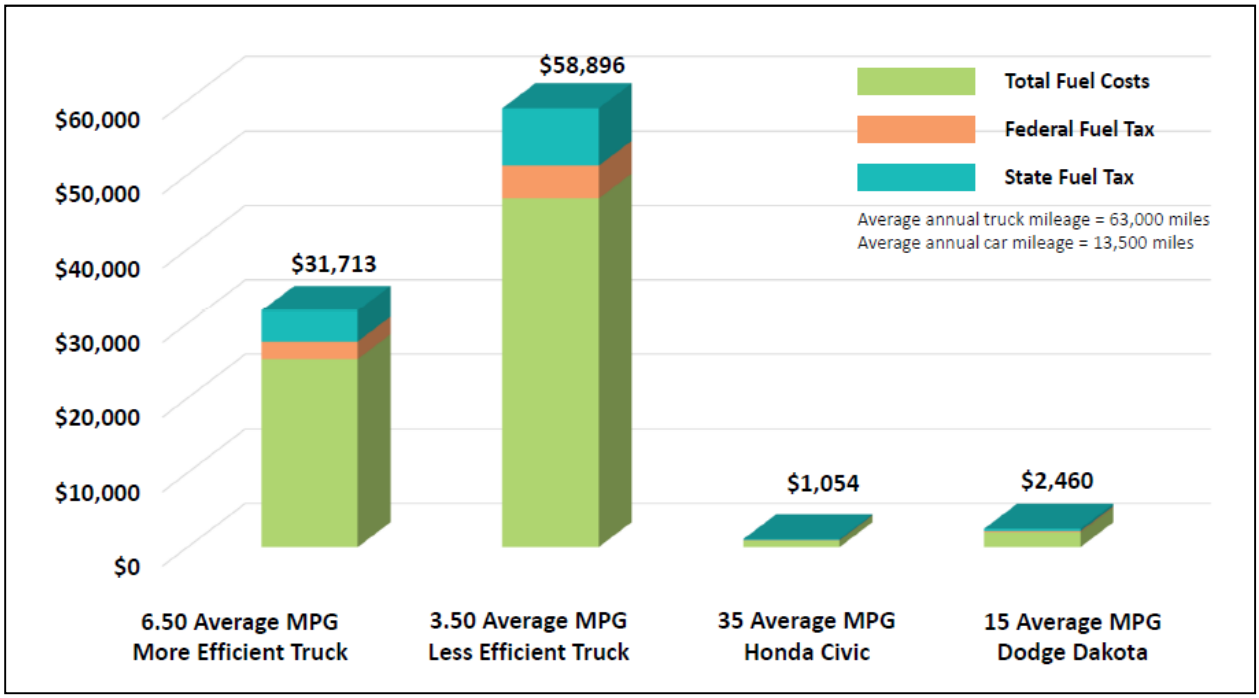
Several differences between semi-trucks and cars are illustrated on Figure 4-1. First, individual trucks on average drive over four times as many miles per year compared to passenger vehicles (63,000 miles compared to 13,500 miles). In addition, the national average fuel efficiency of trucks is 6.3 MPG while the passenger vehicles is 22.3 MPG[19]. Another reason the green bars on Figure 4-1 are larger for trucks versus cars is that the federal diesel tax[20] is higher than the federal gasoline tax (24.4 cents per gallon compared to 18.4 cents per gallon). A similar relationship holds for state diesel versus gasoline taxes in

[19] "Average Fuel Efficiency of U.S. Light Duty Vehicles." Bureau of Transportation Statistics (October 2019). https://www.bts.gov/content/average-fuel-efficiency-us-light-duty-vehicles

[20] Per the Diesel Forum (https://www.dieselforum.org/about-clean-diesel/trucking), in 2018, 75 percent of all commercial vehicles (weight classes 3-8) were diesel-powered, with 97 percent of class 8 big rig trucks being diesel-powered. In the U.S., a small percentage of cars (3 percent) and pickups (13 percent) are also diesel-powered. For the purpose of Coalition MBUF analyses and truck pilots, it is generally assumed that all trucks in weight categories 3 to 8 (i.e., greater than 10,001 pounds GVWR) use diesel, and the remaining vehicles (except buses) use internal combustion engines powered by gas.

several Coalition states (see Table 4-1). The combination of these factors results in higher cost per truck per year compared to a passenger vehicle.

Figure 4-1. Average Annual Fuel Costs and Fuel Taxes for Semi Trucks versus Cars



Note: The average 63,000 miles per year for a semi-truck is based on the BTS numbers for 2016 and 2017 for combination trucks, which are defined by the BTS [21] as "A power unit (truck or truck tractor) and one or more trailing units". This essentially equates to class 7 or 8 trucks depending on the GVWR.

Table 4-1. State Fuel Taxes (2019)

State	State Diesel Tax (cents per gallon)	State Gas Tax (cents per gallon)
Connecticut	43.90	36.85
Delaware	22.00	23.00
District of Columbia	23.50	23.50
Florida	34.97	41.99

[21] "Appendix B – Glossary;" *National Transportation Statistics*; Bureau of Transportation Statistics; 2018; https://www.bts.gov/sites/bts.dot.gov/files/docs/browse-statistical-products-and-data/national-transportation-statistics/217556/appendix-b-glossary.pdf.

Table 4-1. State Fuel Taxes (2019)

State	State Diesel Tax (cents per gallon)	State Gas Tax (cents per gallon)
Georgia	40.07	35.28
Maine	31.20	30.01
Maryland	36.05	35.30
Massachusetts	26.54	26.54
New Hampshire	23.83	23.83
New Jersey	48.50	41.40
New York	44.61	44.10
North Carolina	36.45	36.45
Pennsylvania	75.20	58.70
Rhode Island	34.00	34.00
South Carolina	20.75	20.75
Vermont	32.00	31.19
Virginia	24.71	20.66

Source: American Petroleum Institute State Motor Fuel Taxes Effective Jan 1, 2019

Trucks also pay several additional federal taxes to support the transportation network, including:

- **Heavy vehicle use tax (HVUT):** a fee assessed annually on heavy vehicles operating on public highways at registered gross weights equal to or exceeding 55,000 pounds.
- **Federal Excise Taxes (FET)**: "Narrowly based taxes on consumption levied on specific goods, services, and activities. Generally, excise taxes are collected from producers or wholesalers and are embedded in the price paid by final consumers[22]." FETs that significantly impact trucks include:
  - Tire Tax - imposed on tires strictly manufactured for and used on the public roadways.

[22] "What are the major federal excise taxes, and how much money do they raise?;" Tax Policy Center; May 2020; https://www.taxpolicycenter.org/briefing-book/what-are-major-federal-excise-taxes-and-how-much-money-do-they-raise.

– Retail Truck Tax - a federal excise tax of 12 percent that is imposed on the first retail sale of heavy trucks and trailers.

Four states – Oregon, New York, Kentucky, and New Mexico – also charge a **weight-mileage tax,** a tax based on the mileage driven with the per-mile rate based on the weight of the truck. The particulars of these weight-mile taxes vary between states.

Finally, trucks typically pay more **tolls** than cars. For example, a car driving the Pennsylvania Turnpike from the Ohio state line to New Jersey (I-95 and Delaware River Bridge) will pay $42.10 with E-ZPass. A class 8 semi-truck (80,000 to 100,000 pounds GVWR) with six axles will pay $283.50 with E-ZPass.

In summary, when assessing the feasibility of MBUF for motor carriers, **the full picture of the taxes and fees paid by the trucking industry should be taken into account**. Fuel costs annually rank in the top two average marginal cost for trucking companies and in a competitive low margin business, every cost matters. Even so, various industry associations (e.g., ATA, Truckload Carriers Association, and Owner-Operator Independent Drivers Association) have expressed their support for an increase of the fuel tax and recognize that as the share of trucks using electricity and alternative fuels increases, a new future funding approach is needed. As Chris Spear, the ATA President, stated, "A lot of people talk about VMT. Whether or not that is [the answer], I don't know," he said. "We as an industry have a responsibility to be discussing during the next 10-year span what the future revenue sources could and should be."[23] However, the motor carrier industry clearly expressed disapproval of a truck-only MBUF approach suggested by several lawmakers in February 2020. Instead, a more simplified taxes collection approach could be beneficial (e.g., by consolidating the collection of regimes such as state and federal fuel taxes or FET) to offset the challenges associated with changing to a new funding mechanism like MBUF. Any future sustainable approach would need to apply to all users of the transportation system.

3.2.2 Trucks Operate in a Complex, Heavily-Regulated Environment

Just as trucks come in many different classes (based on weight, axles, and types of cargo carried), so do motor carrier entities and their fleets. As such, a diversity of business models exist within the trucking industry based on vehicle configurations, ownership structures, and cargo characteristics. Over-the-road trucking, or long-distance haulers, have significantly different business models (in terms of revenue per load or per ton, revenue per mile, cost per mile, driver productivity, and fuel efficiency) than drayage drivers who charge per short trip to move goods in and out of ports to intermodal terminals and customer facilities. The business models also vary for time-sensitive local freight firms and for parcel delivery operators that move goods from local warehouses or airports to their final destination.

The variety of uses and vehicle types and complexity of business models means that an MBUF approach for the general motoring public would not translate directly to the trucking industry. Policymakers must

[23] "ATA's Spear sees other ways to pay for infrastructure in the next decade;" Alan Adler, FreightWaves; October 9, 2019; https://www.freightwaves.com/news/atas-spear-sees-other-ways-to-pay-for-infrastructure-in-the-next-decade.

approach MBUF in the context of the trucking industry with nuance and recognize that a one-size-fits-all policy will not produce palatable policy outcomes.

It is also important to note that the roads are truckers' workplaces. Deteriorating infrastructure results in increasing maintenance and operating costs for the industry and results in the industry's willingness to invest in order to improve it. However, as the MCWG expressed, the motor carrier industry acceptance of future funding approaches is linked to using these revenues on the expansion, maintenance, and operation of the roadway network. In essence, there is a strong motivation to ensure future investment results in an improvement of the workplace.

Given that trucks transport a substantial portion of the national economy while sharing the roads with the general motoring public, their business environment is highly regulated, including regulations on driver training, work hours, emissions requirements, vehicle readiness, and tax reporting. While improvements have been achieved in the past (e.g. with the establishment of IFTA and IRP), the reporting requirements are many and complex. Changes to transportation funding mechanisms should not result in adding another level of complexity or reverting from earlier improvements, like before IFTA and IRP. As a way to potentially gain support, MBUF implementation scenarios should assess ways to potentially streamline the motor carrier operating environment.

3.3 Existing Regulations Provide Guidance for MBUF Implementation

One of the objectives of the Coalition's STSFA grant work was to review existing agreements and regulations that involved the collection of mileage data from various commercial vehicles to assess if there may be potential synergies with an MBUF approach. Of particular interest was IFTA, IRP and ELD given all three collect mileage and location information. Granted several other motor carrier regulations exist such as the Unified Carrier Registration and the Unified Registration System implemented by FMCSA, but given these do not involve the collection of mileage, they are not discussed in any detail herein.

3.3.1 IFTA and IRP are Potential Frameworks

The Coalition's hypothesis was that the organizations of IFTA or IRP could conceivably play an important role in an MBUF system for commercial vehicles (and possibly all vehicles). For example, both IFTA and IRP collect information on the number of miles driven in each state which is essential data for MBUF. IFTA also collects information on the amount of fuel purchased in each state which would be necessary to provide fuel tax refunds during a transition period to MBUF. Both have audit and enforcement procedures in place and have experience and credibility with the commercial vehicle community.

IFTA and IRP were both developed to reduce burdensome state-by-state fuel tax and vehicle registration reporting requirements on the trucking industry. IFTA, as well as IRP, are excellent examples of a national approach while still maintaining state independence on rate setting and other areas, resulting in efficiencies on the motor carrier as well as on the agency side.

To explore the potential role of IFTA and IRP, the Coalition conducted an MBUF workshop in February 2019. Around 30 representatives from state departments of transportation, departments of motor vehicles, departments of revenue, departments of taxes, technology partners, truck associations, IFTA, and IRP met to discuss key lessons learned from the establishment of IFTA and IRP, and discuss how IFTA and IRP business processes (e.g., administrative, reporting, clearinghouse, payment process, audits, and enforcement practices) could be applied to an MBUF approach. The key points from the workshop included:

- IFTA and IRP provide a framework template for a national implementation for MBUF.
- General consensus was that it would be possible to expand IFTA, as well as IRP, to include intrastate carriers and/or vehicles less than 26,000 pounds.
- Filing an MBUF report with each individual state would be a step back. Take lessons learned from why IFTA and IRP were set up: to remove the burden on motor carriers to comply with varying state-specific filing periods, definitions, recordkeeping requirements and rules.
- MBUF reporting would need to be done on the fleet level rather than for individual trucks (this is the approach for IFTA) to prevent unreasonable burden on motor carriers.
- Reporting frequency would need to be increased from quarterly to monthly to support a national MBUF approach.
- Review of record keeping requirements (e.g., how long and vehicle-specific data) would need to be revisited in light of a national MBUF system

These key points from the IFTA and IRP workshop were reinforced by the MCWG. Overall, there is a general consensus that **IFTA and IRP provide a framework template for a national implementation for MBUF.**

However, there are several issues to examine and potentially address to better define what an MBUF system for commercial vehicles would look like, how it would operate, and the exact role IFTA or IRP could play in the MBUF system. These areas include:

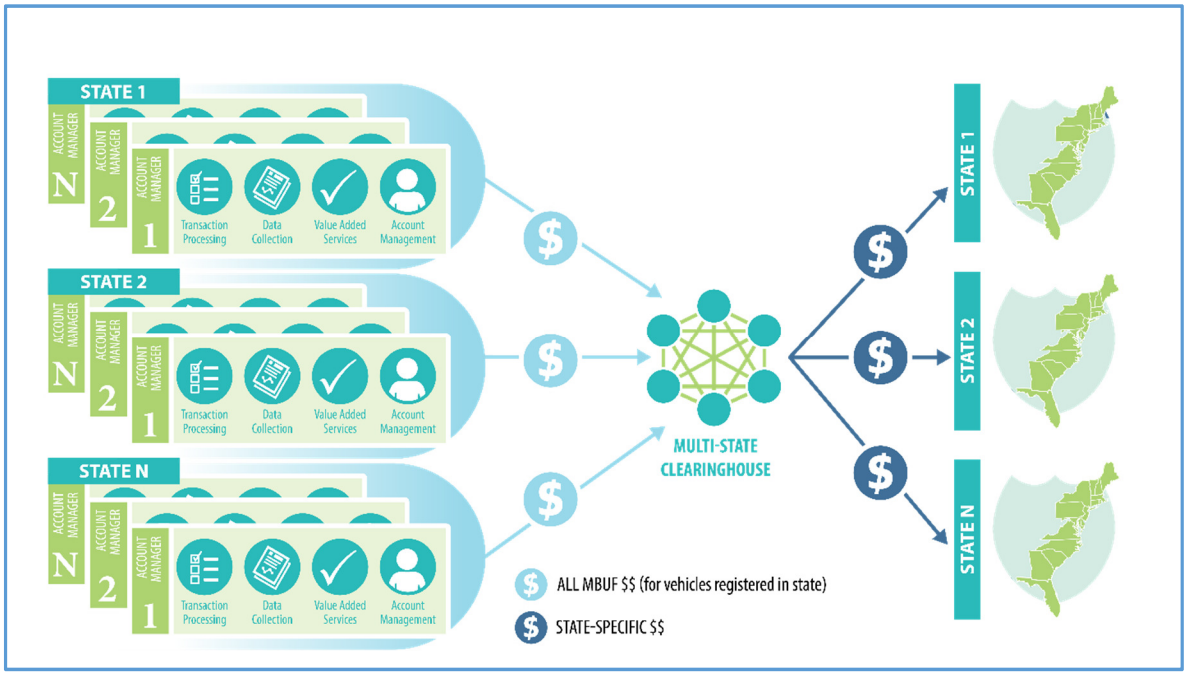
- **Vehicle Types** – Not all commercial vehicles are required to register with IFTA. In an MBUF system, all vehicles need to be enrolled and provide mileage and other data. It is noted that during the IFTA and IRP auditor's workshop, there was a general consensus that it would be possible to expand IFTA, as well as IRP, to include intrastate carriers and/or vehicles less than 26,000 pounds.

- **Processing Cycle –** Registered commercial fleets file quarterly reports with IFTA and annual reports with IRP. Under an MBUF scenario, collections and re-distribution will likely need to occur more frequently to accommodate cash flow needs and state bonding processes.
- **Exemptions, Surcharges, and Consistency –** Different states have different rules for preparing IFTA returns. Numerous states exempt certain vehicles and mileage from IFTA reporting. For example, North Carolina also exempts mileage on non-highways, while Massachusetts exempts mileage driven on toll facilities. Virginia (along with Kentucky and Indiana) include a surcharge on the IFTA quarterly return. Different state-specific requirements for commercial vehicles are a fact of life that a national MBUF system must accommodate, just as per-mile rates in each state will likely reflect the various fuel tax rates in each individual state. Depending on the set up of an MBUF system, there may be further points of differences that would need to be accommodated, such as vehicle type and weight.
- **Fleet vs. Individual Vehicle Reporting –** IFTA provides fleet-based reporting; mileage by state and fuel purchase by state is reported for the motor carrier's fleet as a whole, although information on individual trucks must be kept for auditing purposes. Based on initial discussions with the MCWG and the IFTA and IRP auditors, maintaining such a fleet-based approach for MBUF is desired to minimize the administrative burden on motor carriers. At the same time, being able to determine whether individual trucks have paid the appropriate MBUF is an important consideration in terms of compliance and subsequent audit activities. Another related issue is the record keeping and retention requirements (i.e., data to be kept and how long it is retained) in the context of a national MBUF system.
- **Collection and Distribution of Funds –** States are responsible for the collection of the funds from motor carriers. IFTA's and IRP's primary function is to reconcile, reallocate, and redistribute transportation revenues from fuel taxes and registration fees between states and provinces. The long-term concept behind **MBUF is to replace the fuel tax with a mileage fee.** Under this potential future scenario, some entity or entities will be responsible for collecting the mileage-based revenues directly from motor carriers, potentially acting as an agent on behalf of the states. IFTA and IRP are not set up to collect funds from individual fleets and then forward the revenues to the appropriate state. Such a change in IFTA's and IRP's roles and responsibilities would represent a significant increase in their mission and responsibilities. This approach, along with the impact on staffing and costs, will need to be further examined and analyzed with IFTA and IRP in subsequent phases.

Given the long-term goal of applying MBUF to **all** vehicles and to replace the fuel tax, it is envisioned that a commercial vehicle MBUF system would follow the same model and system configuration that has been developed and implemented in pilot systems for light duty vehicles or vice versa. To create an MBUF for all vehicles, a clearinghouse entity, as shown on Figure 4-3 is also envisioned. Clearinghouse functions would include receiving MBUF funds from account managers and then distributing the collected revenues between states based on mileage, fuel tax paid (by state), and possibly other factors.

In addition to the funds transfers, the multi-state clearinghouse would need to maintain reports and data to back up and justify the fund amounts.

Figure 4-3. Multi-State Clearinghouse with Different Set of Account Managers for Each State



The MBUF clearinghouse could conceivably perform other functions, such as:

- Coordinate the development of systemwide requirements, consistent protocols and interfaces to support automated transfers of data and funds, service level criteria for account manager operations, and necessary audit and compliance activities. It is envisioned that these various obligations would be developed through a joint effort involving state and federal government, technology providers, potential account managers, vehicle manufacturers, commercial vehicle operators, and trucking associations. The requirements would also reference established standards wherever possible (e.g., privacy and data security).
- Oversee technology certification activities. The use of third party and independent certification and subsequent monitoring and audits of MBUF technologies and account managers is seen as very important for any sort of mandated MBUF system that involves the collection and transfer of actual transportation funds. The certification activities would be performed against the various MBUF requirements and criteria referenced in the first bullet.
- Support recurring audits (likely performed by the individual states).

The redistribution of funds between states is very similar to those functions that IFTA and IRP currently perform, although IFTA and IRP activities involve a reconciliation, and – in the case of IFTA – do not

include the full amount of fuel taxes or registration fees paid. Considering the data requirements, IFTA appears to be a viable candidate to function as such a MBUF clearinghouse. However, this would require a significant expansion of its current functions to include the collection of all MBUF funds from account managers and redistribution of the collected revenues to the various state treasures based on miles driven in each state. It is also envisioned that any IFTA-operated MBUF clearinghouse would apply to all commercial vehicles and trucks, not just those that are required to register with IFTA. Moreover, the same MBUF clearinghouse could conceivably be used for all vehicles – trucks and passenger cars – recognizing that the account managers and the requirements for vehicle hardware and transaction processing functions would likely differ between the various vehicle types. The potential clearinghouse functions will be discussed with IFTA and other organizations during future Coalition MBUF work.

3.3.2 ELDs Alone Cannot Support MBUF

Many trucking professionals and policymakers draw a connection between ELD and MBUF; however, there are some key differences between the two that need to be highlighted. ELDs track a truck driver's workday to ensure compliance with federal HOS rules and, as part of that task, require the collection of location and vehicle information at 1-hour minimum intervals. Per the FMCSA requirements, an ELD automatically records the following data elements:

- Date
- Time
- Vehicle geographic location information (longitude and latitude)
- Engine hours
- Vehicle miles
- Driver or authenticated user identification data
- Vehicle identification number (VIN)
- Motor carrier identification data (USDOT number)

The ELD must detect vehicle motion greater than 5 miles per hour and automatically record a "driving" event.

For commercial vehicles that are model year 2000 or newer, engine miles must be derived from the trucks electronic control module (e.g., plugging into the vehicle's diagnostic port.) or the engine's computer. Engine synchronization for purposes of ELD compliance means the monitoring of the vehicle's engine operation to automatically capture data, including: the engine's power status, vehicle's motion status, miles driven value, and engine hours value.

At first glance, it would appear that the data collected by the ELD could serve the needs of an MBUF system. However, these **ELD data (as per minimum requirements) are not collected continuously, nor with acceptable accuracy**. Specifically, the data are automatically recorded only at the following specified events:

- When the driver indicates a change of duty status (e.g., logs into or out of the ELD, beginning and end of authorized personal use of the truck)
- When the engine is powered up or down
- At 60-minute intervals while the commercial vehicle is in motion

ELD data cannot accurately provide a distinction of mileage by state. In addition, the possibility of linking mileage to the location information will not work because latitude and longitude information is obtained just once every 60 minutes. Moreover, the FMCSA-specified accuracy for ELDs is approximately a 1-mile radius during on-duty driving periods, and that accuracy radius expands to approximately a 10-mile radius when a driver has indicated authorized personal use, also known as personal conveyance. In responding to comments on the proposed ELD rule, FMCSA emphasized that "*it does not require real-time tracking of commercial vehicles or the recording of precise location information.*"

ELD technology, as per the minimum requirements, cannot provide the necessary differentiation of mileage by state that is crucial to a viable MBUF system especially along much of the eastern seaboard. Additionally, ELD technology cannot support potential future functions of an MBUF system requiring location and routing information such as integrated tolling (requiring data on toll points the truck crossed through, and when) or congestion pricing (i.e., the ELD does not know the specific routes taken or if and when the vehicle crossed a cordon line around a port).

It is important to remember that the ELD mandate and the associated specifications and functionality were not intended as a fleet management system (FMS). The ELD focus is on the minimum requirements for HOS recording purposes. As noted by the FMCSA[24]:

> *"Although an ELD may be part of an FMS, the ELD functions required by this rule are limited to automatically recording all driving time, and intermittently recording certain other information. The ELD functions will make it easy for the driver to record off duty, sleeper berth, and off-duty not driving time, and transfer that information to authorized safety officials and motor carriers."*

As such, ELD technology is capturing information around the driver's HOS and safety – not around the vehicle travel. Moreover, ELD data are captured on a driver basis; it is not vehicle-based. If a driver switches trucks, then it can show information about two different vehicles on the ELD data

Another issue is that **ELDs are not on every commercial vehicle.** The rule requires all commercial vehicles over 10,000 pounds be equipped with ELD technology; but there are many exceptions.

[24] "Electronic Logging Devices and Hours of Service Supporting Documents;" Federal Register; December 16, 2015; Rules and Regulations, page 78296.

According to FMCSA's estimates, 2.9 million drivers are subject to either the federal ELD rule or a compatible state rule, as compared to the estimated 10.5 million commercial trucks registered in 2017[25].

As previously noted, ELD systems are approved by FMCSA based on a self-certification process, leaving it up to the provider to test that their system meets the technical specification. If FMCSA later finds that an ELD does not comply, it can be removed from the registry of approved systems. **Such a self-certification approach could be problematic in an MBUF system.** Given that MBUF data would be used in the context of financial transactions and for funding the roadway network, a more robust certification process – via an independent third party – will likely be required. Such a process would also need to address compliance and data accuracy and security.

Canada, for example, has implemented ELD regulations, following a study of the ELD implementation in the US. One point of difference is that Canada has chosen to pursue third party certification of devices for ELDs, which may serve as a good framework for understanding what certification of devices fit for MBUF would be like. For example, Transport Canada invites third party accreditation bodies to apply and demonstrate capability to conduct testing against established Testing Procedures and Guidelines.

In summary, MBUF for commercial vehicles will require a more robust technology solution than offered by ELD functionalities alone.

The table below shows how IFTA, IRP and ELD compare across various considerations for MBUF. For example, in the "Qualifying Vehicles" row, all solutions are neutral because, while they capture many qualifying vehicles, none of IFTA, IRP or ELD account for all commercial vehicles.

Area	IFTA	IRP	ELD
Basis of record keeping			
Qualifying vehicles			
Mileage Data Accuracy			
Location data accuracy / precision			
Data retention			
Clearinghouse			
System requirements			

[25] Congressional Budget Office: "Issues and Options for a Tax on Vehicle Miles Traveled by Commercial Trucks"; October 2019.

3.4 One Rate for All Trucks Doesn't Work

The Coalition's multi-state truck pilot clearly showed that **one-rate for all trucks doesn't work due to the vast differences in vehicle operations, types, ages, performance and mileage travelled**. The initial rates for the truck pilot were calculated based on each state's diesel fuel tax and an assumed average truck fuel efficiency of 6 MPG. However, three of the four fleets involved in the pilot had average MPG values less than 6 MPG, resulting in a net MBUF credit (i.e., the MBUF amount charged was less state fuel tax paid). For example, Figure 2-3 compares two trucks: one with 3.5 MPG and one with 6.5 MPG. Assuming each truck drives 63,000 miles per year, the fuel inefficient truck would receive a "rebate" of $3,200 and the fuel-efficient truck would be required to pay a "penalty" of $400. At first, these differences may not seem large, but multiplied over a company's fleet, the costs add up quickly. For example, one company (Carrier A) in the pilot had 40 vehicles with an average MPG of 3.42. If the per-mile MBUF rate was to be set using the national MPG average, this company would receive a rebate of over $68,000 per year in state fuel taxes. The company with the most fuel-efficient fleet was Carrier D, and under the MBUF based on 6 MPG, they would be asked to pay a penalty of over $1,400 for its five fuel efficient trucks. In other words, one MBUF rate across all trucks would create a situation where fuel inefficient fleets would be rewarded and fuel-efficient fleets would be penalized.

The actual MPG for an individual truck can also vary significantly depending on the weight of the load, the age of the truck, vehicle maintenance, and the terrain over which the truck is driven. For instance, drayage trucks operating in an urban, short haul environment will likely not see the same efficiencies as companies that accrue more highway miles. The MCWG suggested bringing several key attributes including age of truck, vehicle class, weight, fuel efficiency. Weight is a particularly tricky item. At first, the logic that the heavier the vehicle, the more wear and tear on the infrastructure and the higher a per-mile rate should be. But it is not necessarily straightforward and based merely on vehicle weight. How the truck weight is distributed among axles and tires, and the resulting pressure from the tire footprints on the roadway surface, plays a critical role in this regard (and tire pressure also impacts the footprint and pressure on the pavement, as well as vehicle performance and safety). Commercial vehicles have numerous configurations in terms of the number of axles and tires, as evidenced in the FHWA vehicle classification scheme shown in Appendix G.

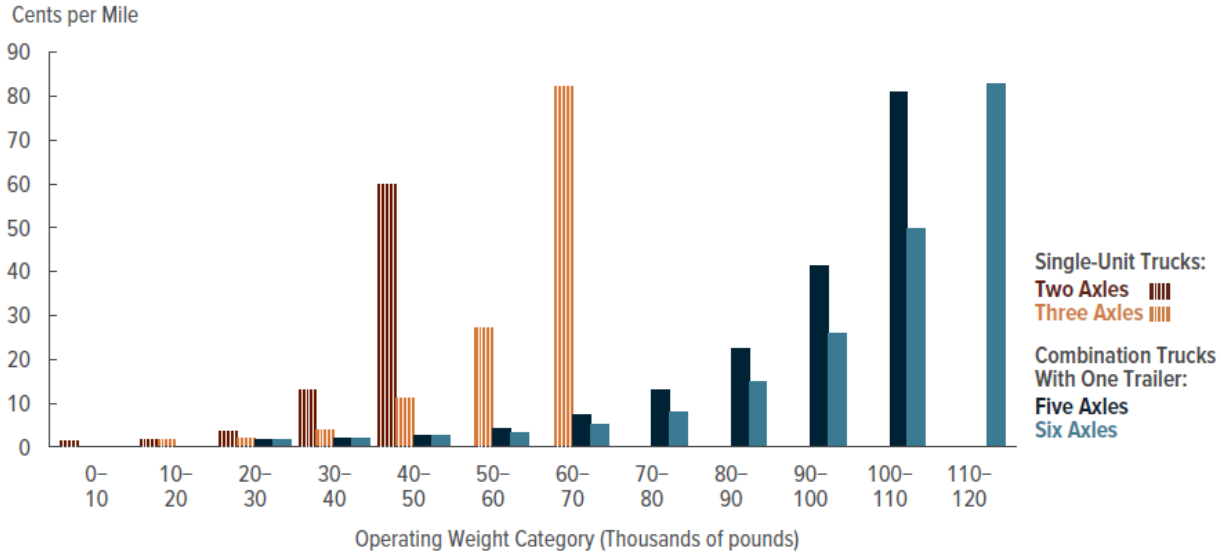
As reported in a recent CBO report,[26] the FHWA produced highway cost-allocation studies in 1982 and 1997 that shed light on the relationship between weight, vehicle configuration and infrastructure costs. For example, Figure 4-5 shows moving from a range of 20,000 to 30,000 pounds to a range of 30,000 to 40,000 pounds almost quadruples the estimated costs to the pavement for a single-unit truck with two axles, from 3.5 cents to 12.9 cents per mile. However, increasing the number of axles and tires reduces the costs, often dramatically. For example, adding a third axle to that 30,000- to 40,000-pound single-

[26] "Issues and Options for a Tax on Vehicle Miles Traveled by Commercial Trucks;" CBO; October 2019.

unit truck reduces the pavement cost by about 70 percent, from 12.9 cents to 4.0 cents per mile. The CBO chart (Figure 4-5) does not show combination trucks with multiple trailers (and more axles) – fairly common today – that further distribute the truck weight among additional axles.

In summary, rate setting will be much more complicated than for passenger vehicles.

Figure 4-5. Estimated Federal Costs for Pavement and Bridges Imposed by Selected Truck Types, Number of Axles, and Operating Weight



Source: "Issues and Options for a Tax on Vehicle Miles Traveled by Commercial Trucks;" CBO; October 2019.

3.5 Further Need for Education and Outreach

Education and outreach are essential to the exploration of MBUF in the context of commercial vehicles. Education on MBUF is a dialogue in which the trucking industry benefits from hearing operational, public opinion, and data details about MBUF as a potential replacement for the fuel tax. Similarly, the national discussion of MBUF would be incomplete if the trucking industry were not at the table providing their unique experience on this topic as well as data from fleet vehicles. The MCWG identified education and outreach to the trucking community as critical to the larger conversation about MBUF. The working group recommended presentations to trucking organizations as part of their annual meetings and appealing to the industry's ongoing interest in transportation infrastructure funding as a way to generate engagement in the policy discussion.

The Coalition was encouraged to see the trucking industry's willingness to engage across a variety of sectors in the first multi-state truck MBUF pilot, and, based on this engagement, anticipates continued collaboration with trucking industry stakeholders. Beyond the Coalition's MBUF activities related to

trucking, the Coalition's passenger vehicle pilots also serve to educate the general public about the need for sustainable transportation funding to build and maintain the transportation system, which is a shared goal of the trucking industry.

As the complexity of MBUF pilots increases, the Coalition is equipping policymakers with data-driven, industry-informed analysis to make pragmatic decisions on the viability of MBUF.

4 Next Steps

The next STSFA grant activities for the Coalition MBUF effort will include a broader multi-state truck pilot. This pilot will include 200 commercial vehicles from across the contiguous U.S. and will run for 6 months starting in the fall of 2020. This multi-state truck pilot will build off the lessons learned from the Phase 2 activities and closely analyze rate-setting by developing per-mile rates for each state, examining weight-based variable rates, and applying multiple rate structures for background analysis. The pilot will also explore proofs of concept about how to use MBUF technology to incorporate existing tolls and MBUF into an integrated driver statement to further study operational efficiencies that could be achieved. The initial parameters and characteristics of this pilot are shown in Table 5-1.

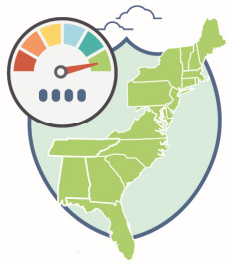
In addition to the pilot, STSFA grant activities will include expanded education and outreach activities. These activities will target commercial vehicles and motor carriers, discussing how MBUF potentially could help provide a more sustainable funding source for transportation and the potential MBUF approaches. The Coalition will continue ongoing meetings with the MCWG to discuss issues and potential solutions associated with the application of MBUF to trucks and will deliver presentations to various trucking organizations.

Table 5-1. Characteristics of the 2019-2020 Multi-State Truck Pilot

Pilot Characteristic	Approach
Size	200 commercial vehicles
Vehicle Types	Mostly class 7 and 8 trucks and some medium trucks (10,000 to 26,000 pounds)
Coverage	Widen the pilot footprint to cover most if not all of the lower 48 states by including carriers from outside the Coalition states.
Per Mile Rates	Rates will be developed for each state in the continental U.S., not just the Corridor Coalition states. State-specific rates will be based on several considerations: • State diesel tax, using IFTA rates. • Average MPG of the pilot fleet (based on recent IFTA reports) • Examining the potential of the following: - Variable rates based on different weight categories - Including IFTA surcharge in the rates - Incorporating additional local and regional taxes on fuel into the rate Include a separate rate for the federal diesel tax. Also examine how other federal taxes (e.g., highway user tax and FET) could be included in the rates. Multiple rate structures will be developed for the pilot and applied in background for subsequent analyses (i.e.,

Table 5-1. Characteristics of the 2019-2020 Multi-State Truck Pilot

Pilot Characteristic	Approach
	not included on the quarterly statement). As a minimum, the quarterly statements will be based on state rates (based on IFTA) and the federal rate.
Automated Tolling	"Desktop" exercise and proof of concept, using the data collected during the pilot, of how MBUF could incorporate existing tolls as part of an integrated statement. This will focus on the toll roads in Delaware, Pennsylvania (Turnpike mainline), and New Jersey (Turnpike).
IFTA and IRP	Further assess the feasibility of IFTA and IRP as frameworks for MBUF implementation
MCWG	Gather input regarding the pilot design, rate setting, standards, and compliance practices

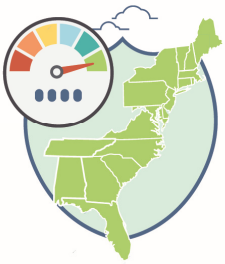


THE EASTERN TRANSPORTATION COALITION
MILEAGE-BASED USER FEE STUDY

Appendix A: ELD, IFTA, IRP Data Requirement Tables

Data Records Requirements

	IFTA	IRP	ELD
Original GPS or other location data for the vehicle	✓	✓	X
Location of each GPS or other system reading	✓	✓	X
Calculated distance between each GPS or other system reading	✓	✓	X
Routes of travel by unit	✓	✓	X
Beginning and ending reading from odometer, hubodometer, or electronic control module	✓	✓	X
Distance by jurisdiction or state line crossings	✓	✓	X
Identification of any exempt miles claimed including distance readings	✓	✓	X
Unit number	✓	✓	✓ Power unit and trailer
Fleet number	X	✓	X
Registrants name	✓	✓	✓
Driver Name and Identification	X	X	✓
Bill of Lading	X	X	✓
Change of duty status	X	X	✓
Engine hours	X	X	✓
Distance recaps	Monthly, Quarterly, Yearly	Monthly, Quarterly, Yearly	X
Record Retention	4 years	5 years	6 months



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Appendix B: Overview of New Zealand RUC System

Appendix B: Overview of New Zealand RUC System

The New Zealand Road User Charge (RUC) system is a well-established example of a MBUF system. The initial RUC system was introduced in New Zealand more than 30 years ago with the passage of the Road User Charges Act of 1977, which set out who is required to pay RUC. One of the key drivers of the act was to develop the ability to recover maintenance and other road expenditures from heavy vehicles in proportion to the costs each type of vehicle imposes on the roadway network system, thus making the user-pays principle more evident in the funding of road construction and road maintenance. In consequence, diesel was exempted from transport taxes.

In August 2012, the Road User Charges Act of 2012 came into effect replacing the 1977 act. The new legislation significantly updated and modernized the RUC system, including establishing a framework for electronic payment of RUC. Key characteristics of the New Zealand RUC system are summarized as follows:

- **Vehicles Subject to RUC -** Two groups of vehicles are required to pay RUC;
  - All vehicles powered by a fuel not taxed at the source regardless of weight. For example, this includes light duty or passenger cars powered by diesel.
  - All vehicles with a manufacturer's gross vehicle mass of more than 3.5 tons (7,716 pounds).
- **Exemptions –** A small number of exemptions have been legislated, including for light duty electric vehicles and plug-in hybrids (although this may end in 2021), heavy duty electric vehicles (until 2025), and specialist vehicles unsuitable for road use, and light duty vehicles used exclusively or almost exclusively off-road (e.g., agriculture or forestry). These exemptions currently account for a very small percentage of the New Zealand vehicle fleet.
- **RUC License –** All vehicles that are required to pay RUC must purchase a distance license before operating on the road (pre-pay). All licenses issued must match the vehicle concerned (i.e., RUC vehicle type, registration plate number, distance recorder serial number, and distance recorder readings). Distance licenses are purchased in units of 1000 kilometers (621 miles) or multiples thereof. Vehicles must be licensed for continuous distance – when the finish distance is reached, a new license is required.
- **Rates -** The distance-based RUC, and the associated rates (per 1000 kilometers) were significantly changed with the 2012 revision, and are based on numerous categories, including:
  - Whether the vehicle is powered or unpowered (unpowered is a trailer)
  - Number of axles on the vehicle

- Number of tires per axle, either single-tired or twin-tired
- Configuration (combination, number of trailers – noting, however, that heavy trailers are required to have their own distance recorder and current RUC license)
- RUC weight – this the "permanent RUC weight" which is the lesser of the manufacturer's maximum rating for the vehicle, or the maximum mass a vehicle of its configuration and size is allowed to operate at on public roads
- The New Zealand RUC Handbook has 5 pages of rate tables, showing the rates for approximately 40 different vehicle and trailer types and permanent weight combinations. Some examples – converting kilometers to miles, and accounting for the exchange rate between the New Zealand dollar and the U.S. dollar:
  - Light duty vehicle: 7.43 cents per mile
  - Powered vehicle with five or more axles (all RUC weights): 38.0 cents per mile
  - Towing vehicle with three axles that is part of a combination vehicle with a total of at least eight axles (all RUC weights): 42.2 cents per mile

In the New Zealand RUC system, every motor vehicle requiring a RUC distance license where the manufacturer's gross laden weight is more than 3.5 tons must be fitted with an approved hubodometer or an approved electronic distance recorder. (EROAD is one of the four approved electronic service providers, along with Coretex, Teletrac Navman, and Picobyte Solutions Ltd.) A hubodometer is a device mounted on the axle of vehicle, such as that shown on Figure G-1, that measures distance traveled. The whole device rotates with the wheel except for an eccentrically mounted weight on an internal shaft. The cost, with mounting bracket, is between $60 to $70 U.S. A 2008 report[27] noted that due to the mounting position in the hub of a moving vehicle, hubodometers are prone to damage particularly when used in off-road environments. The report also notes that the system is prone to evasion (e.g., tampering with the hubodometer).

Figure G-1. Example Hubodometer

[27] Road User Charges Review: Expert Technological Advice; Road User Charges Review Group; December 19, 2008; https://www.transport.govt.nz/assets/Import/Documents/e19bc2ddab/Hyder20Consulting20Expert20Technical20Advice.pdf.

Much of the RUC process and record keeping involves manual activities (e.g., reading the hubodometer). Moreover, the service operators are required to maintain and hold certain records, including:

- Entries in logbooks (must be held for 1 year)
- Permits issued (for 1 year from the date of expiry of the permit)
- Records of maintenance of a vehicle (for 2 years)
- Invoices for fuel and maintenance of RUC vehicles (for 6 years)

The Transport Agency may require the operator to produce these records for inspection.

Electronic RUC (eRUC) was developed specifically to all but eliminate the need for manual inputting. eRUC, as provided by approved electronic distance recorders (such as provided by EROAD), has experienced a steady increase in sales. As of 2019, eRUC comprised 38 percent of all RUC by dollars and 20 percent by distance. For heavy vehicle RUC, eRUC was 60 percent by dollars and 53 percent by distance.

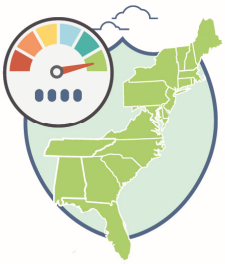
There is a well-defined certification process for becoming an approved eRUC systems provider, including requirements steps that need to be taken, third party testing and recurring audits of the providers. While the approval process has a self-certification component, it is balanced with a review process, which is done through a mandatory audit conducted by an independent security team nominated by the New Zealand Transport Agency, verifying the integrity of the data and processes, ensuring they meet appropriate levels of security. The requirements for an eRUC provider are described in a Code of Practice issued by the New Zealand Transport Agency which also conducts audits of eRUC providers. The code describes the roles and responsibilities of the government, promotes transparency, and supports electronic system providers compliance with relevant international standards and New Zealand legislation.

Several evaluations of the New Zealand RUC system have been performed. One of the latest[28] documented a number of findings, some of which are applicable to any future truck-based RUC system in the U.S., including:

- The main barrier to eRUC has been the cost of the initial installation of the system and ongoing costs. Many operators noted it was the other fleet management and reporting features that make eRUC systems worthwhile for their fleet (i.e., value-added services). The report also identifies other potential incentives for increasing the use of eRUC – increased competition (to reduce costs) and making it mandatory (possibly with government reimbursement). The New Zealand government is depending on market forces for encouraging increased usage of eRUC.
- As previously noted, there is a well-defined process for becoming an approved eRUC systems provider, including requirements steps that need to be taken and third party testing.

[28] "Evaluation of the New Road User Charges System"; Cycle Three Evaluation Report, December 2016, Allen + Clarke

- There is a lack of back office interaction between the RUC system (in both its paper and electronic forms) and permitting systems at the national or local levels. Having no way to cross check declared weight with any associated permits, particularly with overweight permits, creates additional administrative costs for operators.
- There is a lack of flexibility, borne of ambiguity, in the treatment of vehicles that alternate between working at or under their RUC weight, and working under permit at some higher weight. One example is provided in the evaluation report of an owner of a towing vehicle who noted that he uses it for heavy and light loads ("whatever comes through the door").
- Consequently, this operator is unable to use the lower cost pro-forma H-license, and instead has to purchase additional licenses on a per-job basis for the appropriate additional weight, incurring additional administrative cost and potential delay.
- Education and outreach remain essential. The report notes that a perception held by government officials, industry associations, and operational staff is that owners of light duty diesel vehicles have a poor understanding of the RUC system. A survey indicated that 38 percent of respondents believed they had moderate knowledge of the RUC system.



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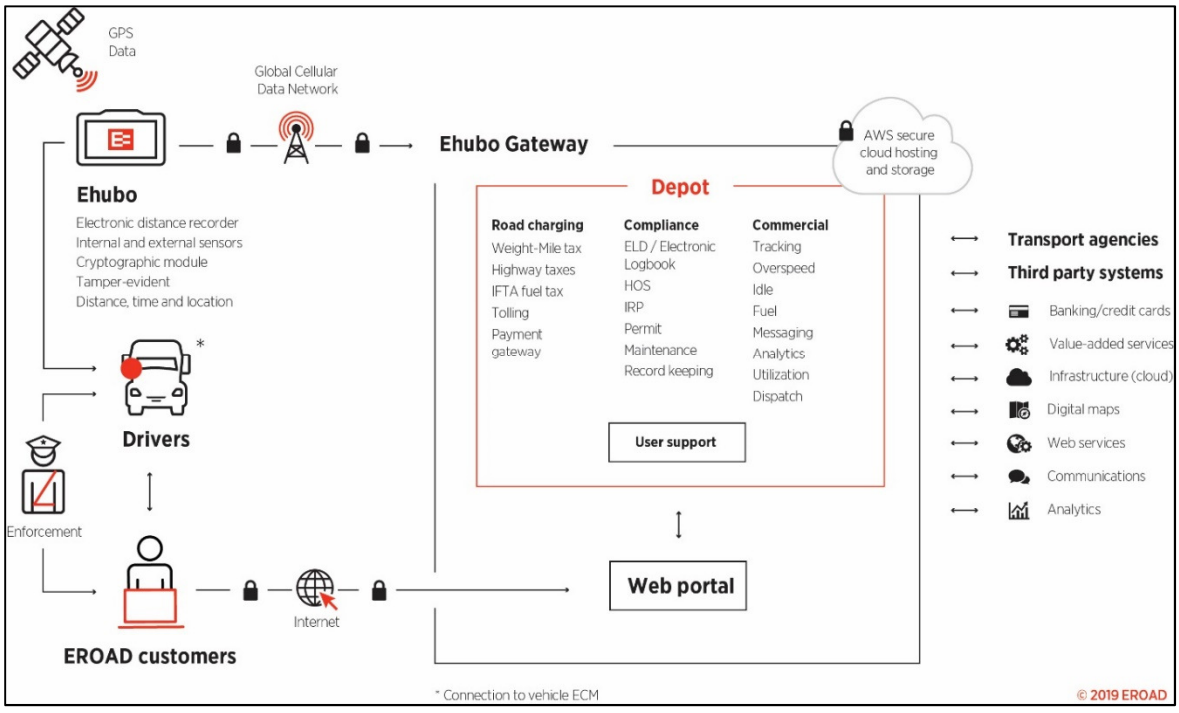
Appendix C: EROAD System Details

Appendix C: EROAD System Details

The architecture of the EROAD system is shown on Figure C-1. The core element of EROAD's system is the secure on-board unit (OBU, also called Ehubo) which collects data to provide regulatory and commercial services, including: HOS, ELD, electronic IFTA and IRP record keeping, electronic Weight-Mileage Tax reporting (e.g., Oregon), and to provide trucking companies with tools to monitor driver performance and improve fleet management, thereby enhancing safety and operations. EROAD designs its products with privacy and security in mind and uses network architecture and data centers which are built to meet the requirements of the most security-sensitive organizations. The same data collected by EROAD can also be used to measure and collect MBUF. The OBU uses a combination of internal and external sensors to measure the distance the vehicle travels, and to capture location (e.g. state) and route, including GPS satellites and inertial sensors. These sensors continually monitor distance during travel which ensures the continued accuracy of the distance measurements and assists in tamper detection.

Figure C-1. EROAD System Architecture



The OBU employs sophisticated security architecture using internal and external sensors to prevent tampering and fraud and to reliably measure distance traveled. The hardware is designed to withstand extreme environmental conditions and operate with degraded sensor data and poor cellular coverage. The vehicle data captured from the hardware is transmitted by a secure cellular link to a web-based

system where it is processed to calculate and prepare records and reports, such as IFTA, and MBUF charges. The web application interfaces with the government's transport registry, payment facilities, and digital map provider. The web-based system also provides a real-time view of the vehicle data for the management of the fleet and securely stores the data records in accordance with the statutory record-keeping requirements. An in-vehicle device (Figure C-2) is installed in the cab of the truck to provide information to the driver and by which the driver may change their duty status or vehicle configuration.

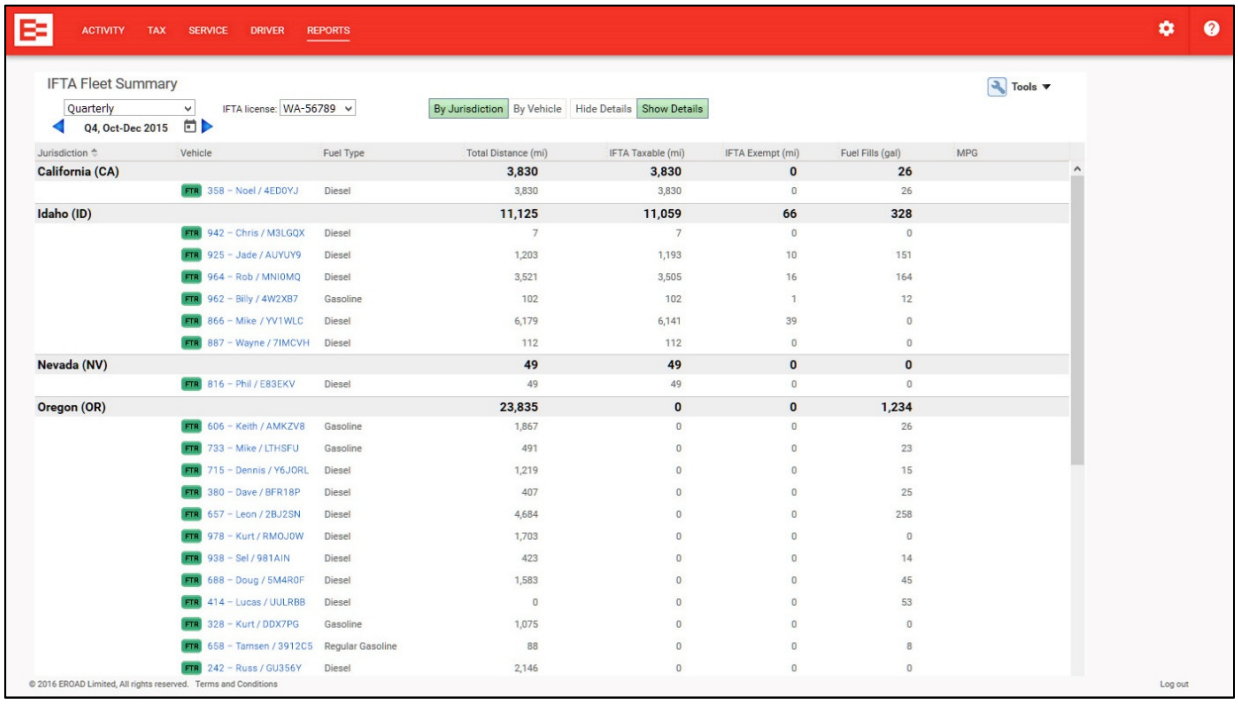
Figure C-2. EROAD In-Vehicle Device

The EROAD system was the first ELD to be certified by an independent third party as meeting the FMCSA's requirements The EROAD system provides many additional functions as summarized below.

IFTA, IRP, and Other Tax Reporting

The data collected supports electronic IFTA and IRP reporting as shown on Figure C-3. The collected data is stored according to the IFTA and IRP record-keeping requirements to support recurring IFTA and other audits performed by the states.

Figure C-3. Sample of IFTA Summary Information

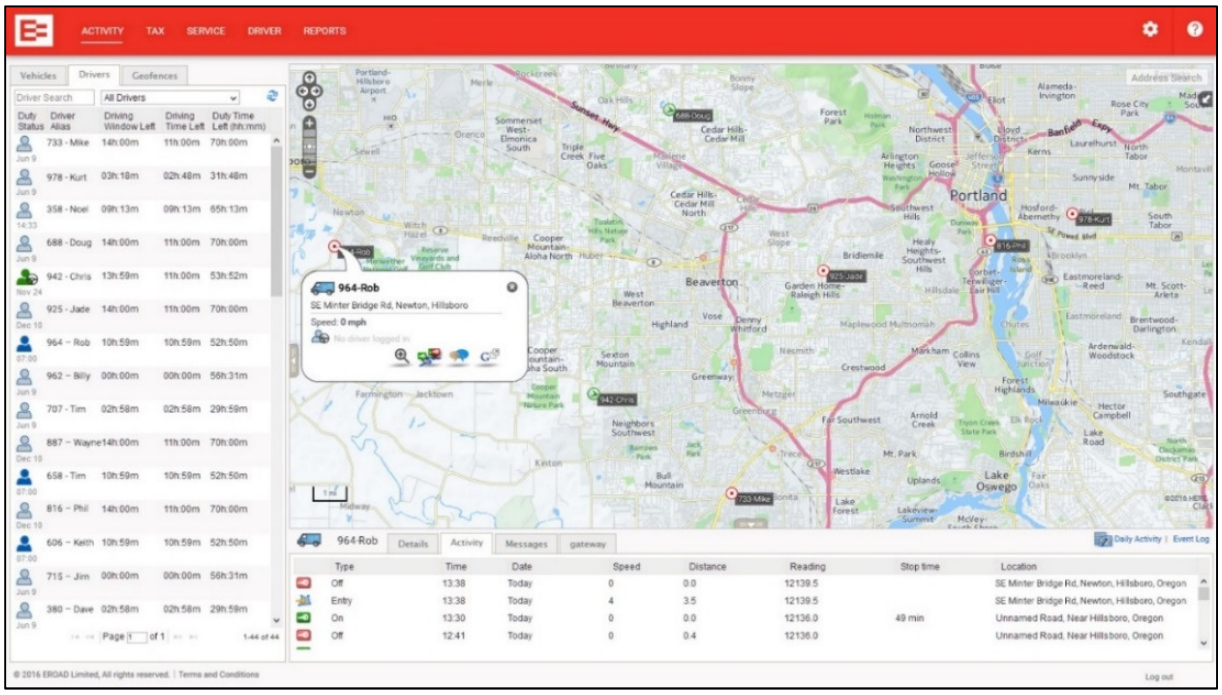


Fleet Management and Safety

The location, route, and activity information support fleet management practices and can help to increase productivity. For example:

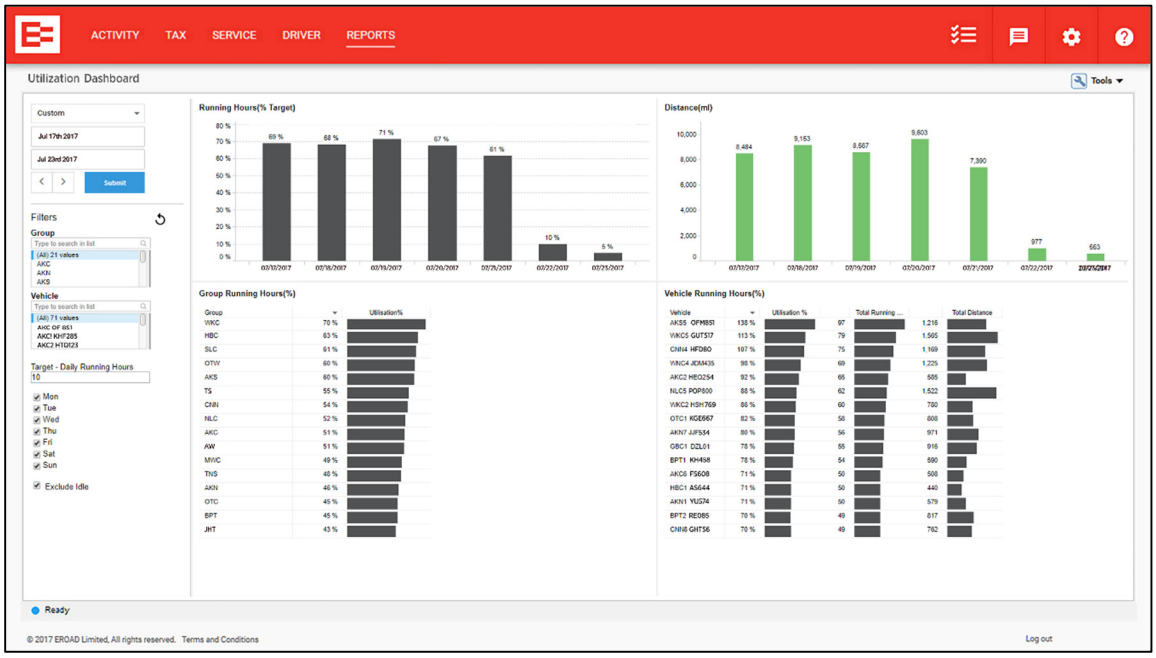
- Mapping (Figure C-4) that gives dispatch and service operations an accurate view of vehicle locations, status, routes, and activities completed through the day. This helps to verify stops being made and time onsite. The mapping includes multiple layers such that dispatcher can view physical and legal height, weight, width, and length restrictions for a journey, and plan using traffic flow information. A geofencing capability is also included to track vehicle and asset entry and exits, report exempt miles during construction periods, or to set safe (or customized limited speed) zones.

Figure C-4. Sample EROAD Mapping



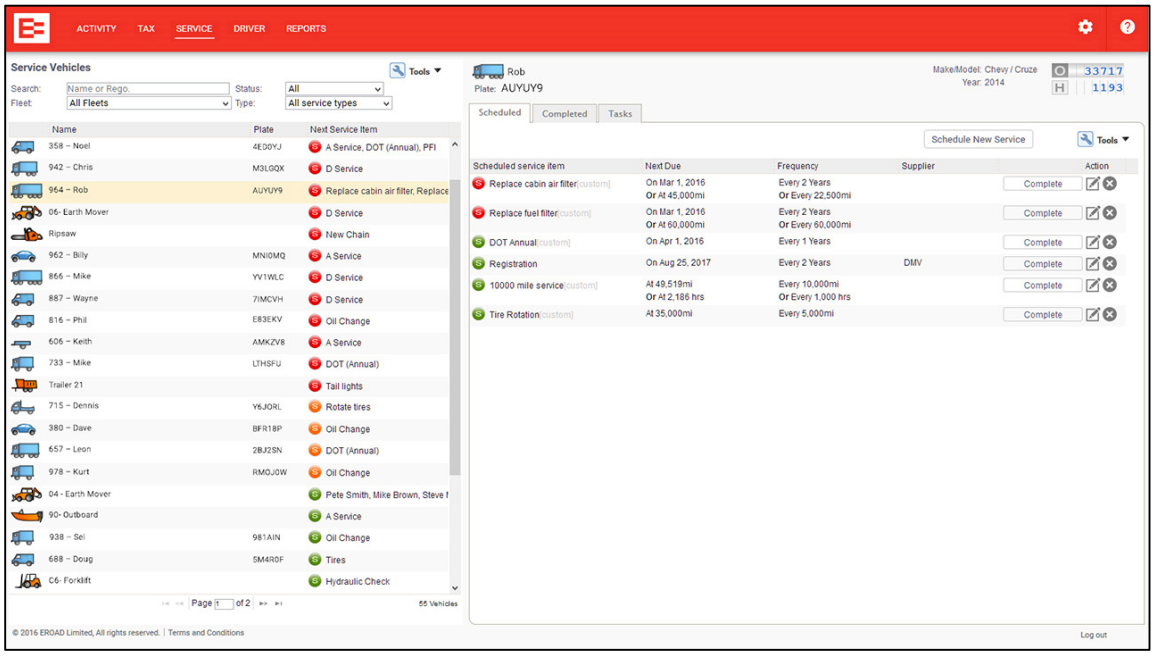
- Activity reports of daily vehicle activity (Figure C-5) to monitor operations, ensure service levels, and optimize vehicle utilization, manage disputes, and support billing. This includes graphs that reveal utilization trends for distances and engine hours, to ensure they are in line with expectations and gain insights into how to optimize fleet size and make-up.

Figure C-5. Sample Activity Report



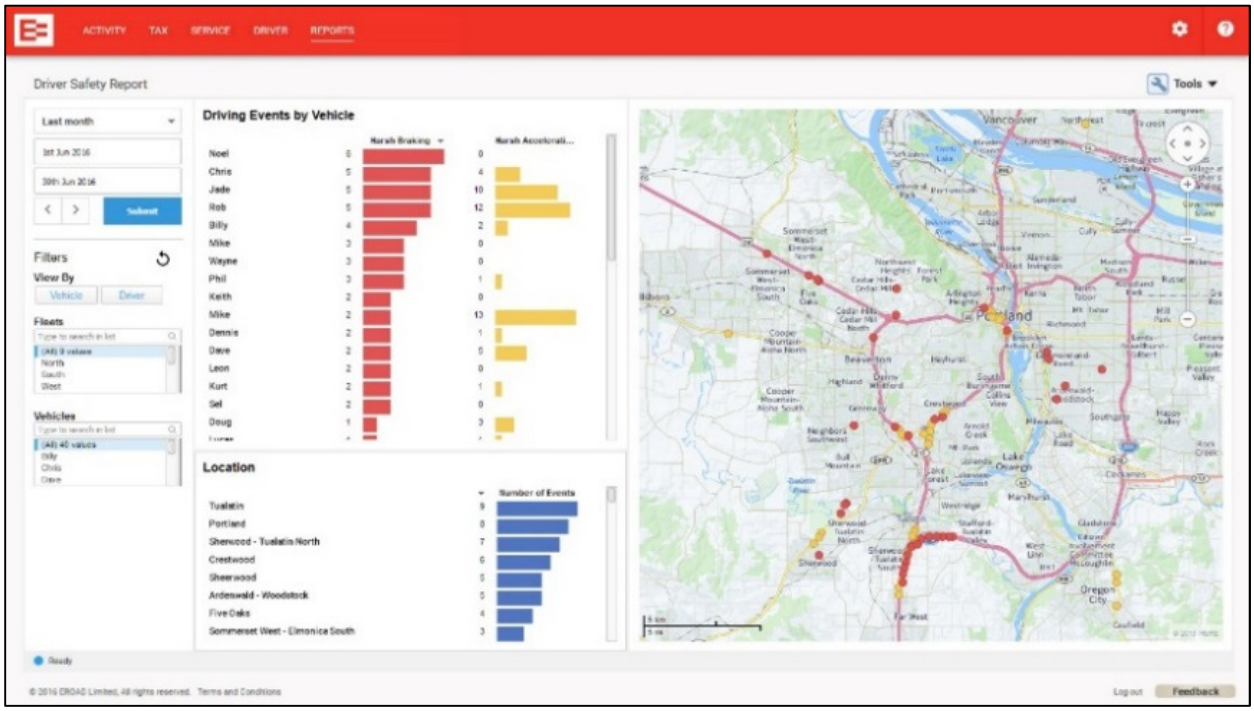
- Maintenance and service reports (Figure C-6) that support proactive maintenance. These include service history reports; reports showing average and total idle time by vehicle, along with trends to help reduce vehicle wear and tear; and tools for developing vehicle service schedules based on time lapsed, distance traveled, or engine hours.

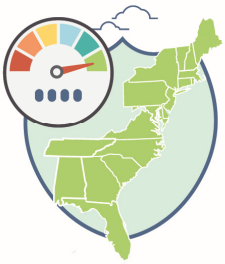
Figure C-6. Sample Maintenance Report



- Safety reports (Figure C-7) that include a dashboard providing an organization-wide view of safety incidents to support targeted feedback and greater understanding of risk areas (e.g., dangerous roads and times of day), and individual driver reports with events including speeding, harsh braking, hard acceleration, and hard cornering for subsequent coaching.

Figure C-7. Sample Safety Report





THE EASTERN TRANSPORTATION COALITION
MILEAGE-BASED USER FEE STUDY

Appendix D: Truck Pilot Participant Agreement

Appendix D: EROAD Pilot Agreement

EROAD details

Name	EROAD
Address	
Contact	
Email	
Phone	

Carrier details

Name	
Address	
Email	
Phone	

Signatures

Signed for EROAD Inc. by its authorized representative:

Name		Signature	
Role		Date	

Signed by Carrier:

Name		Signature	
Role		Date	

Introduction

A. From 1 October 2018, a six-month multi state truck pilot will commence on the East Coast of the United States ("**the Corridor**"). The purpose of the pilot is to explore the feasibility of using existing regulations and technology as a framework for a potential future Mileage Based User Fee approach and to gain understanding of the carrier industry's requirements.

B. EROAD has been selected by the I-95 Corridor Coalition and the Delaware Department of Transportation and in conjunction with CH2M (together referred to as "**Partners**") as a vendor for the Corridor pilot project ("**The Pilot Project**").

C. The EROAD system will automatically record information related to each vehicle participating in the Pilot Project and the miles travelled on the Corridor. The EROAD system will generate monthly reports for the Partners and invoices. The monthly statement (received via email) will outline the amount of the usage fee (based on miles reported), less any credits for the estimated amount of fuel taxes paid based on the average fleet MPG per the IFTA return. The simulated payment method used during the course of the Pilot Project will be simulated automatic bank transfer so no funds will be actually transferred.

D. The parties have agreed that the Carrier will participate in the Pilot Project. In consideration for their participation in the Pilot Project, the Carrier will be provided, free of charge, with the right to use EROAD products and services for the duration of the Pilot Project. At the start of the Pilot Project, a dedicated account manager from EROAD will contact the Carrier and be the main point of contact for the Carrier in relation to any matters concerning the Pilot Project.

The parties further agree:

Term and Termination

1) This agreement starts on 1 October 2018 and will run until 31 March 2019 ("**Term**"), unless extended by mutual agreement.

2) Either party may terminate this Pilot agreement at any time during the Term by written notice of termination delivered to the other party.

EROAD'S Responsibilities

3) During the Term, EROAD grants Carrier a non-exclusive, non-transferable license to use EROAD's web portal (Depot), product features and associated documentation solely for use in connection with the Pilot Project for the duration of the pilot (October 2018 – March 2019).

4) EROAD will install the Electronic-On-Board-Recorder (Ehubo) in each agreed vehicle at a time and place agreed upon by Carrier.

5) EROAD will arrange for the Ehubo to be removed from the vehicle at the end of the Pilot Project or within a reasonable time following cancellation of this Agreement.

6) EROAD will meet the cost of installing, and at the end of the Pilot Project removing, the Ehubo. EROAD will not be responsible for restoring the Carrier's vehicle(s) to its pre-installation condition.

7) EROAD will provide Carrier with set-up, training and user documentation.

Disclosure of Data

8) The key Pilot Project objectives are for EROAD to share data with Partners in order to enable Partners to conduct analysis, and reporting, to:

   a. study the feasibility of regulations and technology as a framework for future mileage-based user fee (MBUF) approach; and

   b. to ultimately assess feasibility of MBUF as an alternative for transportation funding. (collectively referred to as "**the Pilot Project Objectives**")

9) To enable the Pilot Project Objectives, the Carrier grants EROAD the right to disclose the following data to Partners during the Term of this agreement **("Pilot Data"):**

   a. The Carrier's name, address and industry;

   b. Each of the Carrier's vehicle information participating in the pilot, including the registration plate and the vehicle type and make;

   c. Distance travelled by jurisdiction;

   d. Total monthly distance travelled by jurisdiction by each vehicle;

   e. Total monthly distance travelled by each vehicle overall;

   f. Any detailed information provided to Partners will be anonymized. Only monthly summaries of distance travelled by vehicle provided to Partners will include vehicle information. EROAD will not share with the Partners any specific location data relating to a particular vehicle of the Carrier.

10) The Carrier agrees that Partners may continue to use the Pilot Data for the purposes of the Pilot Project Objectives after the Term.

11) EROAD acknowledges that the Carrier's data is confidential, commercially sensitive and solely owned by the Carrier. Prior to disclosing the Pilot Data to Partners, EROAD will procure an agreement from Partners that any reporting will not disclose any personal information contained within the Pilot Data that can be used to identify, contact or locate an individual.

Your Responsibilities

Obligations

12) During the Term, you will provide:

a. the required company vehicle(s) for the purposes of installing the EROAD hardware for the purpose of the Pilot Project;

b. IFTA return for Q4 2018 and Q1 2019;

c. tolling statements; and

d. Pilot feedback (by way of interviews and surveys).

Responsible behavior

13) During the Term you will be required by EROAD to:

a. Use the EROAD products and services in a responsible manner;

b. Not attempt to copy, modify, adapt, disassemble, decompile, make derivative works of, tamper or interfere with, or change the configuration of, the features and services of the EROAD products and services;

c. Not breach any intellectual property rights in anything forming part of, or accessed using, the EROAD products and services;

d. Comply with all laws that may apply to your use of the EROAD products and services;

e. Not transfer to anyone else any of your rights or responsibilities under any of the terms relating to your participation in the Pilot Project;

f. Accept that it is a necessary part of the Pilot Project for anyone in EROAD to collect information about your usage of the EROAD products and services.

Consequences of Termination

14) Following termination or expiration of this agreement, the EROAD products and services may be discontinued. Should you wish to continue using the EROAD products and services you may need to agree to a new set of terms and conditions that will govern your use of EROAD products and services at that time.

Confidentiality

15) The terms of this Pilot agreement are confidential and may not be disclosed to any third party without EROAD's prior written consent unless it is already publicly available, through no fault of yours ("**Confidential Material**").

16) If you are legally required to disclose any of the Confidential Material, you must advise EROAD of this before disclosing it and you must only disclose that part of the Confidential Material which EROAD's legal advisers reasonably believe is necessary to disclose by law.

Eroad's Rights and Liability

17) The Carrier, its officers, directors, agents and employees shall indemnify EROAD from and against any third-party claims against EROAD for losses (including lost data, revenue or profits), liabilities, claims, costs and expenses (including, but not limited to, reasonable attorneys' fees) of any nature whatsoever arising out of or related to this Pilot agreement or the subject thereof.

18) To the fullest extent permitted by law, EROAD shall not be liable to the Carrier for any loss or damage whatsoever which is suffered (including, without limitation, loss of profits, or indirect or consequential loss), or for personal injury suffered or sustained, as a result of participating in the Pilot Project.

19) Where EROAD is liable to the Carrier and for any reason EROAD cannot rely on the exclusion of liability set out above, the maximum combined amount for which anyone in EROAD will be liable to the Carrier and anyone else who uses the services provided to the Carrier is limited to $1,000 for any event or for any series of related events but not more than a total of $5,000 in any 12 month period.

Privacy

20) You agree that anyone in EROAD may collect personal information about you in relation to the Pilot Project or in order to enable your participation in the Pilot Project. You may ask to see information held about you, as long as EROAD can readily retrieve it, and ask for any details that are wrong to be corrected. EROAD and other members of EROAD, including our third party agencies, may also hold the information, share it with each other and with EROAD employees and contractors of EROAD, with Partners and with other service providers participating in or associated with the Pilot Project.

21) EROAD will also produce non-personal data reports that do not reveal the identity, activities or contact details of any specific person. The collected information will be securely stored and only accessible to researchers involved in the Pilot Project. The data used for these purposes will not contain any participant specific information and will only be used at the aggregated level (combined with other participants' data).

22) **Disclosure of Personal Information to Third Parties**. Given a key purpose of the Pilot is to gain understanding of the carrier industry's requirements, you will be asked to participate in interviews and surveys. Another third-party company will be conducting these surveys and reach out to you via email. The third-party company will not have access to the pilot data collected by EROAD and is legally required to adhere to this privacy policy and protect your personal information.

23) We may ask you to participate in future trials. If you agree to participate in future trials, these trials will be governed by separate pilot agreements.

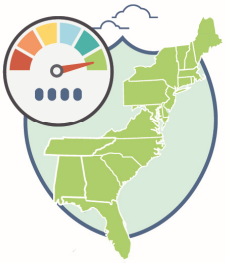
24) All personally identifiable information collected solely for the purposes of the Pilot Project, will be destroyed within 60 days of the completion of the Pilot Project. Non-personal information (i.e. total mileage, vehicle make and model, etc.) may be retained indefinitely and used for other research purposes. All data will be anonymized, securely stored, and only individuals involved in the research study will have access to the data.

General

25) **Entire agreement:** This Pilot agreement constitutes the entire agreement between the parties in relation its subject matter and supersedes and extinguishes all previous drafts, agreements, arrangements and understandings between them, whether written or oral, relating to its subject matter. The terms of this agreement may be modified only by written agreement.

26) **Governing Law.** This Pilot agreement is governed by the laws of the State of Oregon and the parties submit to the jurisdiction of the courts of the State of Oregon.

27) **Survival.** Clauses 9,10, 13, 14 15, 16, 17, 18, 19, 20, 21 and 24 will survive termination of the Agreement.



THE EASTERN TRANSPORTATION COALITION
MILEAGE-BASED USER FEE STUDY

Appendix E: Truck Pilot Sample MBUF Statement

I-95 Multi State Truck Pilot Statement
October 2018 – March 2019

Carrier

Fleet information

# of trucks	Average MPG (Q4 2018)	# of states traveled
5	6.33	16

Summary for the Pilot

Billable Miles Driven During the Pilot*		273,945.2	
Gallons of Fuel Used During the Pilot**		44,590.88	
	Estimated costs you currently pay*	Estimated MBUF based on 6 MPG (national average)	Estimated MBUF based on 4.1 MPG (pilot average)
Estimated Fuel Costs	$117,023.00	$117,023.00	$117,023.00
Federal Fuel Tax	$10,880.17	$10,880.17	$10,880.17
State Fuel Tax	$18,920.28	-	-
Mileage-Based User Fee****	-	$19,635.99	$28,118.51
Total Estimated Costs	$146,823.46	$147,539.16	$156,021.68
Net Difference from current: Rebate / (Owed)		($715.70)	($9,198.22)

Please note that all charges reflected on this statement are simulated. No amount of monetary value will be exchanged

*Distance exemptions as per IFTA.
**Based on your Average MPG
*** Based on per State monthly prices exclusive of taxes, sourced from the US Energy Information Administration
**** (Billable miles driven per State) x (per mile rate per State)

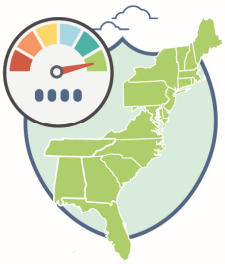
Disclaimer: The I-95 Corridor Coalition members and EROAD want to promote a better understanding of why investing in transportation is important, and why the current fuel tax does not provide a long-term and equitable solution in this regard. The Coalition, representing transportation agencies along the entire Eastern Seaboard, and EROAD believes exploring the feasibility of a MBUF solution is important; for now, however, the Coalition and EROAD are neutral if MBUF is the ultimate solution.

I-95 Multi State Truck Pilot Statement
October 2018 – March 2019

State	Total distance (mi)	Billable distance (mi)*	Estimated State fuel tax you currently pay**		MBUF Rate 1 (National average 6.0 MPG)***		MBUF Rate 2 (Pilot average 4.1 MPG)***	
			$ per gallon	Total $	$ per mile	Total $	$ per mile	Total $
Connecticut	46,870.6	46,870.6	0.4390	3,249.06	0.0732	3,430.93	0.1071	5,018.58
Delaware	106.9	106.9	0.2200	3.71	0.0367	3.92	0.0537	5.74
District of Columbia	-	-	0.2400	-	0.0400	-	0.0573	-
Florida	-	-	0.3437	-	0.0573	-	0.0788	-
Georgia	-	-	0.3000	-	0.0500	-	0.0734	-
Maine	72,510.1	72,510.1	0.3120	3,572.29	0.0520	3,770.53	0.0761	5,517.84
Maryland	614.3	614.3	0.3455	33.51	0.0576	35.38	0.0879	54.01
Massachusetts	45,942.7	37,495.6	0.2400	1,741.09	0.0400	1,499.82	0.0585	2,194.86
New Hampshire	8,815.9	8,815.9	0.2220	309.04	0.0370	326.19	0.0581	512.29
New Jersey	24,848.3	24,848.3	0.4420	1,734.25	0.0737	1,831.32	0.1183	2,939.37
New York	24,580.1	24,580.1	0.3915	1,519.53	0.0653	1,605.08	0.0584	1,435.84
North Carolina	-	-	0.3510	-	0.0585	-	0.0889	-
Pennsylvania	57,486.5	57,486.5	0.7410	6,726.32	0.1235	7,099.58	0.1807	10,389.63
Rhode Island	584.2	584.2	0.3300	30.44	0.0550	32.13	0.0829	48.45
South Carolina	-	-	0.2000	-	0.0333	-	0.0506	-
Vermont	-	-	0.3100	-	0.0517	-	0.0780	-
Virginia	32.7	32.7	0.2020	1.04	0.0337	1.10	0.0578	1.89
TOTAL	**282,392.3**	**273,945.2**		**18,920.28**		**19,635.99**		**28,118.51**

*Distance exemptions as per IFTA.
**Based on your Average MPG
*** (Billable miles driven per State) x (per mile rate per State)

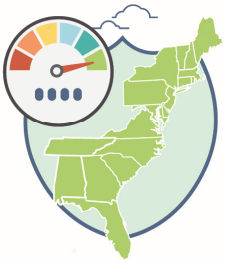
Disclaimer: The I-95 Corridor Coalition members and EROAD want to promote a better understanding of why investing in transportation is important, and why the current fuel tax does not provide a long-term and equitable solution in this regard. The Coalition, representing transportation agencies along the entire Eastern Seaboard, and EROAD believes exploring the feasibility of a MBUF solution is important; for now, however, the Coalition and EROAD are neutral if MBUF is the ultimate solution.



THE EASTERN TRANSPORTATION COALITION
MILEAGE-BASED USER FEE STUDY

Appendix F: Phase 2 Steering Committee Members

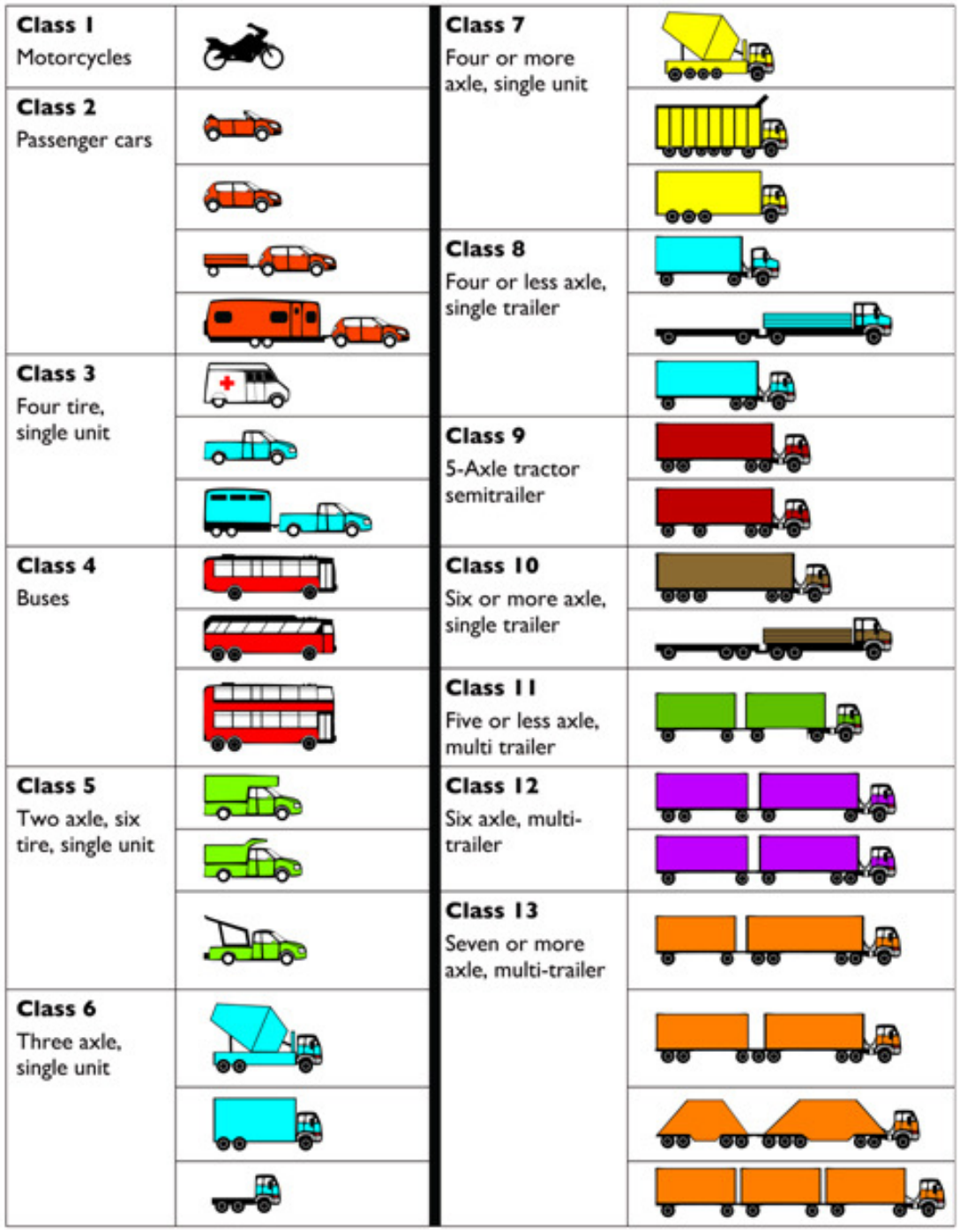
Agency	Position
Delaware DOT (DelDOT)	DelDOT Secretary
	Chief Engineer
	Director Community Relations
	Director of Finance
	Department of Motor Vehicles Director
Pennsylvania DOT (PennDOT)	PennDOT Secretary
	Policy Director
	Director of Fiscal Management
	Senior Advisor to the Secretary
	Manager Vehicle Registration
North Carolina (NCDOT)	Director, Strategic Initiatives
	Deputy Director of Strategic Initiatives, Program Support
The Eastern Transportation Coalition	Executive Director
Port Authority of New York and New Jersey	Deputy Director
American Automobile Association (AAA)	Vice President, Public and Government Affairs
America Trucking Association (ATA)	Vice President, Highway Policy
American Association of State Highway Transportation Officials (AASHTO)	Program Director, Transportation Finance
Auto Alliance	Executive Vice President, Federal Govt Relations & Public Policy
International Bridge, Toll, and Turnpike Association (IBTTA)	Director and Chief Executive Officer
National Governors Association	Environment, Energy & Transportation Program Director
U.S. Chamber of Commerce	Executive Director for Transportation Infrastructure
Federal Highway Administration (FHWA)	STSFA Lead, and Delaware and Pennsylvania Division Representatives



THE EASTERN TRANSPORTATION COALITION
MILEAGE-BASED USER FEE STUDY

Appendix G: FHWA Vehicle Classifications

Figure G-1. FHWA Vehicle Classification Using Number of Axles



Source: "Vehicle Types;" FHWA; November 7, 2014;
https://www.fhwa.dot.gov/policyinformation/tmguide/tmg_2013/vehicle-types.cfm.