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by Enhancing Mobility"*

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Mileage-Based User Fees: Defining a Path toward Implementation Phase 1: Defining a Research Strategy

Final Report

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16. Abstract This report documents early activities of a two-phase research effort composed of three interrelated components: 1) a technology assessment, 2) an institutional assessment, and 3) a one-day implementation-focused symposium. Each component builds from the mileage-based user fee framework developed with funding in 2008 from the University Transportation Center for Mobility™ ("Feasibility of Mileage-Based User Fees: Application in Rural/Small Urban Areas of Northeast Texas", TRIS Accession Number 01121765). The technology assessment evaluated mileage-based user fee technology configurations currently in use internationally and under study domestically. The technology assessment established what technologies are available for a regional mileage-based user fee system that would best meet the objectives outlined in the user fee framework developed in the previous phase of this research. As part of this effort researchers also assembled a technology assessment team comprised of various specialists in order to provide input on the technologies being discussed. The institutional assessment was conducted in conjunction with the technology assessment and involved the study of various user fee frameworks in place throughout the United States. This assessment aided in determining the most appropriate model to incorporate for a mileage-based user fee system administered by the NET RMA pursuant to the objectives of the mileage-based user fee framework. A one-day symposium in April 2009, conducted in Phase 2 of the project, brought together domestic and international transportation specialists for the purpose of identifying a possible pathway toward full implementation of a mileage-based user fee as a replacement for the fuel tax.			
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Mileage-Based User Fees - Defining a Path Toward Implementation

Phase 1: Identifying a Research Strategy

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EXECUTIVE SUMMARY

The contents of this report cover the efforts of researchers to explore potential pathways toward implementation of alternative financing systems to the fuel tax, specifically mileage-based user fee systems, at the state and federal levels. Mileage-based user fees, at the most basic level, would levy a fixed fee on each mile driven within an implementing jurisdiction. Their design enables them to address many of the long-term threats facing the fuel tax, mainly in that:

- revenue from a mileage-based fee system would not decline as average vehicular fuel efficiencies increase.
- revenues can be captured from vehicles that do not require fossil fuels to operate.
- mileage-based fees are tied directly to use and can be structured to send appropriate market signals to drivers so as to maximize the efficient use of the nation's roadway system.

While mileage-based fee systems have been tested by the Oregon Department of Transportation and the Puget Sound Regional Council, and a national assessment is currently being conducted by the University of Iowa, there has been a lack of research evaluating the potential strategies that might be employed in deploying these systems at the state and/or federal level.

This research effort involved three parallel aspects: an institutional review, a technical review and a national symposium that was hosted by the University Transportation Center for Mobility (UTCM) and the Texas Transportation Institute (TTI).

At the conclusion of the first phase of research, and thus at the time of this final report on Phase 1, all three of these activities were ongoing. Therefore, this research report highlights the work that was completed as of February 28, 2009.

INTRODUCTION

Replacing the fuel tax has become a hot topic with regards to transportation financing at the federal and state levels. Fees that more accurately reflect use of the national roadway network, such as fees based on vehicle miles travelled (VMT), or “mileage” fees, are among primary contenders as a full-scale replacement. The National Surface Transportation Infrastructure Financing Commission, the National Surface Transportation Policy and Revenue Commission, and the Transportation Research Board have all endorsed mileage-based uses as a viable and desirable means of generating revenue for national infrastructure development. The Oregon Department of Transportation (ODOT), the Puget Sound Regional Council (PSRC) and the University of Iowa have conducted or are in the process of conducting pilot studies to test the technical applications that may be deployed in support of a mileage-based user fee system as well as the public acceptance issues that such a system would create .

There are three primary justifications made for a transition away from fuel tax-based financing of the nation’s infrastructure network:

- The increasing fuel efficiency of the U.S. auto fleet, driven by high fuel prices and federal environmental regulations, is driving down fuel consumption and thus fuel tax revenues;
- As alternative fuel vehicles gain greater market penetration, there will eventually develop a potentially large segment of the auto fleet that falls outside of the traditional fuel tax collection framework;
- Fuel taxes fail to send appropriate market signals to drivers, thus leading to overutilization of scarce roadway resources at peak periods of the day.

Mileage-based user fees are a desirable replacement to the fuel tax precisely because they address, or can be structured to address, the three main criticisms of the fuel tax. Because they are based on miles driven and not the amount of fuel purchased and consumed, their revenue base will not be threatened by the increasing fuel efficiency of the domestic automotive fleet. Depending on administrative structures for fee calculation and collection, they can capture miles driven by vehicles falling outside of the fuel tax collection framework. Furthermore, pilot projects by ODOT and the PSRC have shown that congestion pricing elements can be applied so as to better allocate roadway usage among drivers, when desired.

By all accounts, the technical issues surrounding a transition to mileage-based user fees do not appear to pose a significant obstacle. Rather, it is the institutional issues that must be addressed first and foremost. These cover a wide range of issues that include:

- Potential administrative structure
- Potential implementation strategies
- Issues of public acceptance

In looking at these issues, TTI researchers utilized a multi-faceted strategy, beginning with a literature review of institutional issues surrounding the fuel tax. Researchers also focused on evaluating past programs implemented at the federal level that might bear some similarity to the current effort being evaluated, namely programs and mandates that represented a fundamental shift from the status quo in terms of program structure and administration.

To establish the critical institutional issues that should be considered in the course of this research effort, an institutional assessment team was formed composed of experts in transportation research, transportation finance, economics and tax policy.

This assessment was conducted in conjunction with an assessment of technical issues surrounding a potential mileage-based user fee deployment. As part of both assessments the UTCM hosted a symposium on mileage-based user fees in April of 2009. Symposium attendees were asked to consider three questions:

- What are the greatest challenges or barriers to transitioning from the fuel tax to a per-mile fee?
- What would the transition look like and who would lead?
- What additional research, testing and demonstration are needed?

INSTITUTIONAL ASSESSMENT

Researchers first conducted an analysis of the Real ID Act and the International Fuel Tax Agreement (IFTA) to highlight similarities between these two programs and a potential transition to mileage-based user fees. These programs were selected because they represent a significant diversion from the status quo within their policy area and required (or require) extensive coordination from federal, state and local authorities. Researchers concluded that based on experience from these two programs, the following elements should be incorporated to any mileage-based user fee implementation strategy:

- Clearly articulated program goals;
- Attainable time frames;
- Allowance for flexibility in program administration at the state and local levels;
- Federal financial assistance, if necessary.

Researchers next undertook an examination of the various issues specific to a transition to mileage-based user fees. After first examining research compiled through completed and ongoing pilot studies of this concept, researchers next conducted a telephone conference with experts in public finance and economics in order to highlight various institutional issues surrounding mileage-based user fees and a potential transition to these fees as the primary source of funding for transportation projects. This teleconference is discussed in more detail in the next section.

Finally, through the UTCM, researchers organized and hosted the first Symposium on Mileage-Based User Fees in Austin, Texas, on April 14 and 15, 2009. The goal of the symposium was to bring together professionals in the field of mileage-based fees for the purpose of sharing information on current applications and exploring future potential as a supplement or replacement for the fuel tax.

On December 22, 2008, TTI researchers conducted a telephone conference with experts in public finance and economics in order to highlight various institutional issues surrounding mileage-based user fees and a potential transition to these fees as the primary source of funding for transportation projects. The team was composed of:

- David Ellis, Texas Transportation Institute, Mobility Analysis
- Curtis Beaty, Texas Transportation Institute, Research and Implementation Division
- Doug Freer, Texas Comptroller of Public Accounts, Revenue Estimation
- Lori Taylor, The George Bush School of Government and Public Service
- David Ungemah, Texas Transportation Institute, Austin Office
- Trey Baker, Texas Transportation Institute, Austin Office
- Ginger Goodin, Texas Transportation Institute, Austin Office

General Issues

At the outset of the institutional assessment team's initial discussions, the following question was raised: If the long-term adequacy of the fuel tax is threatened by increases in fuel efficiency, then why not simply bring the fuel tax back in line by raising it and possibly indexing it? This is indeed an attractive and simple option, as the fuel tax is well established and is accepted by the public as a fee for use of the nation's roadway system. While raising the fuel tax might be politically difficult, it would not require the extensive administrative and institutional developments that a mileage-based alternative would require.

When the fuel tax was initially implemented on a national basis, there was at the time no better way to assess a road user fee. Fuel consumption was generally a good proxy for road use, as the range of fuel efficiencies at that time was more homogeneous. However, there is currently a bifurcation in the range of fuel efficiencies with a general trend toward higher fuel efficiency. It may therefore be more appropriate to develop a new revenue mechanism that is more reflective of actual use.

However, there are potential equity issues with regards to the fuel tax. The fuel tax does not vary based on income, meaning that it has a disproportionate effect on lower income drivers than on middle and upper income families. This equity concern could be applied equally to the mileage-based fees currently being considered for implementation. However, there is an additional compounding factor with regards to the fuel tax's equity. If there is a significant relationship between income and fuel efficiency, then the fuel tax may place an even higher burden on lower income drivers. There is currently no available research to support this

assertion, but it is possible that lower income drivers are more likely to own and drive older and less fuel efficient vehicles than middle and upper income drivers. If this is the case, then a low income driver of a low fuel efficiency vehicle is most likely paying more in fuel taxes per mile driven (per use, that is) than the driver of a more fuel efficient vehicle. Furthermore, it is likely that if there is a relationship between income and fuel efficiency, it is probably an inverse bell curve: as income increases, so does fuel efficiency up until a point where income is so high that fuel efficiency no longer becomes a concern.

It is possible that equity concerns might be raised by rural residents under a VMT-based system, as they tend to drive longer distances and might view a mileage-based fee system as unfairly penalizing them. However, it is important to note that a VMT fee system could be implemented that accounts for the lower cost of providing road upkeep services in rural areas. In spite of the fact that there may be less traffic in rural areas than in urban areas, that road space is still being used and an appropriate road charge should be determined.

There are efficiency arguments to be made against the fuel tax, especially with regards to taxes paid by commercial vehicles. Large commercial trucks generally pay diesel taxes, but these taxes are the same amount per gallon as regular gasoline taxes. However, large commercial trucks damage roadways by several orders of magnitude over regular personal vehicles.

Concerns over global warming are on the rise, and one of the more environmentally attractive aspects of the fuel tax is the incentive it offers toward utilizing more fuel efficient vehicles. A VMT/mileage-based fee could offer a similar incentive by adjusting fees relative to vehicle weight, with heavier and presumably less fuel efficient vehicles being taxed at a higher per-mile charge. Some of this price incentive is already captured in vehicle registration processes.

The potential for a VMT-based fee to generate income over the fuel tax was discussed, and it was noted that it might be reasonable to include future increases in fuel taxes for revenue comparisons. Simply assuming that fuel taxes will never be raised might not be realistic and would overstate the benefit of implementing a VMT-based revenue generating mechanism.

Precedence

In the current research effort it may be beneficial to look at other national coordination efforts so as to better guide national VMT-based fee development. Moving away from the fuel tax as the primary source of transportation program revenue presents many issues of major consequence, as such a transition represents radical departure from the status quo. School finance might be a public policy area worthy of further research.

One lesson that can be gained from the outset is that these efforts rarely succeed the first time around and require education and persistence. Champions will be extremely important no matter what strategy is employed, as they can “take the arrows” if the idea is a worthy one. With VMT-based user fees researchers have an advantage in that the required technology is not

ready and transportation practitioners can get ahead with outreach efforts. However, there will always be the threat of litigation.

Legislative and Legal Issues

It is likely that a transition to VMT-based user fees as the primary mechanism for financing transportation programs, at least at the state level, will require legislation. For example, Chapter 162 of the tax code would have to be changed, and the state legislature would likely have to approve a pilot project.

It is unknown at this time to what extent laws and regulations affecting the distribution of revenue would need to be amended. It is currently not possible to obtain information on fuel tax revenue generation by location. If that were possible, it may be easier to determine what laws would need to be changed or what laws and regulations would be affected by a transition to VMT-based fees. Commercial vehicles are currently subject to an international fuel taxation agreement, in which each truck is domiciled in a home state and fuel taxes are paid to the states where travel occurs. This requires truckers to keep detailed records of fuel consumption and miles driven. The various states then “settle up” with each other. Truckers are generally required to keep and maintain this information anyway, but only interstate truckers are subject to the interstate fuel taxation agreement.

It is unknown to what extent VMT-based revenues would be affected by the state’s constitutional dedication of 25 percent of fuel taxes to general education. However, it is likely that absent a constitutional amendment, 25 percent of revenues would not go to the Available School Fund. The Available School Fund is made up of state tax revenues and supports the Texas public school system.

Implementation Issues

An initial step in developing VMT-based fees as a replacement of the fuel tax might be to implement a voluntary system or a system that would apply only to electric vehicles. These are the vehicles that are going to fall outside of the current fuel tax system and would essentially be using the national road network for free (or close to free, given that they would still need to be registered).

If states decide to implement a fee system that is initially voluntary, it is likely that there will have to be incentives offered for participation in the program. This will, however, reduce revenues even though the fee will need to be structured so that it is revenue neutral with the fuel tax. It will be important to ensure that there is enough revenue present to address transportation needs while at the same time provide an incentive to participate in the program and utilize more environmentally sensitive vehicles. These are policy issues that will need to be addressed by lawmakers.

One of the biggest problems to address in implementation will be evasion issues. This will be especially difficult if states adopt a system in which older vehicles are retrofitted with the appropriate technology. In this case it may be very easy to tamper with the devices. One of the advantages of a pay-at-the-pump system, such as the one tested in Oregon, is that if any tampering of the device occurs, or if the device malfunctions to the point that fee information is not transmitted, then the driver will always pay the fuel tax as a default.

Packaging a VMT-based fee system to a public that is used to paying a fuel tax it knows relatively little about will be a challenge. It may be beneficial to present transportation services as a type of public utility, such as electricity and water services. The amount paid for these services is based on actual use, and the public might be able to better associate the new fee with the benefit they receive. Furthermore, cell phone and Internet usage plans, which utilize unlimited use, could also function as a viable customer model.

VMT-based fees can be structured for purposes other than revenue generation, such as congestion pricing. However, pricing has not gone over well with the public, as was recently illustrated in New York and Manchester. This leads to the question of whether a large-scale transition away from the fuel tax would require an election. It is most likely, however, that an election would not be required unless the fee system required a constitutional amendment. Constitutional amendments are relatively common in Texas, and proponents of a VMT-based fee system should not give the impression that they are trying to circumvent the state constitution. Implementation must be credible.

One of the more attractive aspects of a VMT-based fee system is that it could possibly be designed and implemented so as to allow for local retention and use of funds generated locally. This would represent a complete shift in the way transportation funding is allocated to local governments and could possibly lead to delays in getting local projects off the ground.

Issues for Further Exploration

The preceding discussion, coupled with ongoing research on the part of the Bush School of Government and Public Service and TTI, has informed a future research plan that will be focused on:

1. Identifying “parallel” programs and fee systems;
2. Evaluating various aspects of these programs and developing a “best practices” document;
3. Identifying additional issues related to mileage-based user fees in general that necessitate further research.

Program Identification

Researchers have currently identified several programs (both transportation and non-transportation related) for evaluation. These include the Real ID Program, the Commercial Driver's License Information Service and the International Fuel Tax Agreement. The system by which commercial vehicle fees are apportioned among the various states will be evaluated, as well as any other programs or fee systems identified in the research as being similar in terms of implementation and/or administration.

These programs were selected because they required or require extensive coordination on the part of federal, state and local agencies. And, like a potential mileage fee transition, they represent fundamental shifts in established public policy. In this sense, the programs can be viewed as being parallel to the current effort.

Best Practices Analysis

The programs and various fee systems previously identified will be analyzed in terms of the strategies utilized in addressing various institutional issues. These issues have been identified in both the preceding discussion as well as ongoing research into mileage-based user fee implementation. The findings of this analysis will be used to develop a best practices or lessons learned document that can be applied to the current effort.

Researchers will focus on answering the following questions:

1. How was/is the primary purpose (or goals) of the program determined?
2. To what extent were/are the existing policies of local, state and federal agencies in conflict with one another?
3. Was/is public outreach and transparency an issue? If so, how was/is it addressed?
4. How were/are fee amounts determined?
5. Was/is the private sector involved and, if so, in what capacity? How was the decision to include/not include the private sector made?
6. How were/are responsibilities allocated between local, state and federal entities?

By answering these questions a basic strategy for coordinating the development of mileage-based user fees at the national level can be developed. Furthermore, this strategy should be applicable in the event that a mechanism other than one utilizing mileage- or VMT-based user fees is selected as the preferred financing alternative over fuel taxes.

The findings from this analysis can be linked to the dual mileage-based user fee frameworks developed through previous UTCM-funded research. These frameworks were designed to aid policymakers in determining the preferred business model and technology configurations for a potential mileage-based user fee system. For example, if it is determined that private sector involvement can significantly reduce administrative costs, then researchers will evaluate how private sector entities could be involved in the development and/or administration of a mileage-based fee system, as the frameworks state that the new system needs to be of minimal cost relative to the fuel tax. It is known that there will need to be significant public outreach and education efforts. Real ID is a fairly unpopular program publicly, yet the Commercial Driver's License Information Service is a relatively unknown program outside of the commercial trucking industry and various Departments of Motor Vehicles. They are both national ID programs, yet what is so different about the two that one generates so much attention on the national stage while the other is relatively anonymous? The findings from this analysis will be beneficial in informing future public outreach and education efforts.

General Mileage-Based User Fee Issues

In addition to the above analysis, researchers will continue to identify general mileage-based user fee issues. That is not to say that these issues will be researched and analyzed by TTI or the Bush School. Rather, this process is meant to serve as a means of identifying areas where additional research may be focused in the future.

For example, there are several equity issues with regards to mileage-based user fees that bear further investigation. A case can be made that such fees are more equitable to lower income drivers than the current fuel tax. However, this assessment is predicated on an assumed relationship between average income and average vehicle fuel efficiency that has yet to be proven.

There is the question of how much commercial vehicles actually pay for use of the national highway system. There is recognition that trucks cause more damage to roadways, and since trucks pay the same diesel tax rate as non-commercial vehicles, there is a perception that trucks do not pay their fair share. However, when one considers the various registration and other apportioned fees paid by commercial vehicles on a yearly basis, it is possible that trucks are indeed paying their fair share. Determining an actual "use payment" for commercial vehicles could affect the way a mileage fee is structured from a commercial vehicle perspective.

There may be general implementation-related issues that bear further examination. One that has already been identified is the potential need to develop incentives to participate in a future mileage-based user fee system. The nature of these incentives will depend very much on whether the system is voluntary and to what extent electric and hybrid vehicles utilize the national road system. Projecting future travel by these vehicles will be very beneficial, as these would be the most likely targets of a compulsory mileage-based fee system.

As previously noted, these issues will not be directly addressed in the current research effort. They merely serve to highlight areas where there is a lack of available data.

TECHNICAL ASSESSMENT

As part of the technical assessment, TTI researchers formed a technical assessment team composed of TTI researchers and representatives from the tolling industry familiar with Intelligent Transportation Systems (ITS) and other transportation-related technologies.

The team was composed of:

- Kevin Balke, Texas Transportation Institute
- Cesar Quiroga, Texas Transportation Institute
- Chris Poe, Texas Transportation Institute
- Roberto Macias, Texas Transportation Institute
- Ed Seymour, Texas Transportation Institute
- Bill Krenik, Texas Instruments
- Glenn Dietiker, Telvent/Caseta, Inc.

The first meeting was conducted on December 22, 2008. In the following sections, the questions that were discussed in each meeting are presented in italics.

General Discussion

If the federal government or the states are to move to a mileage-based fee system as a replacement to the fuel tax, it will be necessary to demonstrate to the public how the new system adds value. If the conversion is being attempted with the primary goal being to increase revenues available for transportation projects, it is likely that the public will favor simply increasing the fuel tax, as it is already well established and familiar. Any new system must be seen as an improvement over the existing system, not just a replacement.

In order to further illustrate how a mileage-based user fee system would be an improvement over the existing fuel tax-based financing system, it will be necessary to estimate potential revenues from such a system. This will help determine the acceptability, usability, and capability of the various technological configurations being considered with lower revenue estimates necessitating cheaper configurations.

Privacy and Legislative Concerns

A primary and recurring issue raised by the technical assessment team was that if a fee is going to be applied to the miles driven by a vehicle, then it will be necessary to track vehicles. If this is

done, law enforcement most likely will want to use the information for criminal cases. This was determined to be a critical issue in terms of driver privacy.

The following examples illustrate how such an issue might be resolved:

- Traffic cameras – Traffic cameras do not save information. Thus, law enforcement agencies do not generally make requests for traffic camera information.
- Toll tag speed maps – Tolling agencies generally scramble data before transmitting them. There are unique identifiers contained within, but there is no way of tying the information to a specific vehicle. Furthermore, tolling agencies generally try to avoid situations in which they may need to provide information to law enforcement.

Another critical issue identified by the team was importance in determining what sort of laws are currently in place that might affect pricing, and whether there are laws that would prevent variable pricing by vehicle type. The German truck tolling system currently employs a pricing system that charges more for vehicles with higher emissions classifications and otherwise older trucks. It is unknown at this time to what extent existing state and federal legislation might affect the ability of a domestic transportation authority to implement variable pricing by vehicle type; however, it is currently illegal to charge varying rates based on area AND residence status. For example, under current state law it would be illegal to charge a non-neighborhood resident to drive through a neighborhood if that neighborhood's residents are not subject to the same fee.

With regards to existing laws, it was again noted by the team that there may be laws currently in place (or laws that will be developed) that would determine how law enforcement can use information gained from a mileage-based fee system. For example, what would prevent a court from being able to subpoena information related to travel times and locations and, if this information is available, a how can this and related issues be addressed? While the answers to these questions are not available, these issues will need to be addressed. At present, the public does not realize or care about the availability of personal travel information. However, if a system such as the one being discussed here were to be implemented on a wider, regional scale, the public would begin to have concerns.

Protecting privacy will be a very important aspect of any future mileage-based fee system. There are currently several different strategies being considered. The simplest and most private method of collecting mileage information is to simply have the odometer read once a year, such as at annual inspections or vehicle registration. Rhode Island is currently considering just such an arrangement. The main problem with such a system, however, is that drivers are charged for miles driven outside of the jurisdiction of the taxing authority, in this case the State of Rhode Island. This particular aspect is already generating opposition in Rhode Island, as a significant percentage of the population commutes into adjacent states on a daily basis.

To rectify this issue, driver privacy must be compromised. For example, to determine when a vehicle is outside of the taxing authority's jurisdiction, said authority might employ global positioning system (GPS) technology. Miles accumulated outside of that particular jurisdiction

would then be exempt from the mileage fee. The system tested in Oregon utilized just such an arrangement. Participating vehicles were equipped with an on-board unit (OBU) that utilized GPS technology to determine vehicle location with regards to pre-determined zones. Mileage within each zone was recorded by the OBU, but no location-specific data were stored.

In general, it would be best for a system to not store location data.

Policy Issues

It is possible that most of the mileage driven within any given area will be generated within urban areas. A mileage-based user fee system, if implemented as a replacement to the fuel tax as the primary mechanism for financing transportation development, might therefore lead to a debate on the provision of revenues to urban roads versus rural roads. It is possible, if not likely, that less money will be available for rural areas. This is an issue that will require further exploration.

Furthermore, it is possible that a mileage-based user fee system might work to drive down VMT, thus reducing potential revenues. For example, the steep fees applied in the Singapore cordon pricing system worked to discourage vehicles from entering the cordoned zones.

However, from an environmental perspective a reduction in VMT would be viewed as a good thing. In fact, one of the advantages of the current fuel tax is that by raising fuel prices the tax provides a small incentive for drivers to purchase more fuel efficient vehicles or utilize non-single occupant modes of travel. It may be beneficial, therefore, to structure a mileage-based user fee so that these incentives are included, whether it be in the form of a reduced fee or a yearly refund (similar to the income tax) for high fuel efficiency vehicles. A system where all drivers pay a flat fee and are then provided a rebate based on various factors may warrant consideration.

It is curious to note that the current fuel tax does not work to discourage driving as a mileage-based fee system might be expected to. This is in large part due to the fact that the tax is included in the purchase price of fuel and most drivers are unaware at any given time how much they pay. In fact, most drivers are unable to provide basic information about the tax, such as the amount of the tax or what it is actually applied to.

One of the advantages of a financing mechanism based on actual miles travelled is that it could provide transportation agencies with more detailed information regarding revenue generation. For example, revenue generation could be analyzed at the state, regional, county or even facility level. However, this is again likely to generate a strong debate about how revenues are spent in rural areas versus urban areas. If revenues are retained within the area they are generated, will there be sufficient revenue for rural projects? Or will revenues generated in rural areas be used to subsidize urban projects?

General Technology Issues

One of the main questions that will need to be addressed while moving forward is to what extent the technologies currently being considered for mileage-based user fees will be utilized and developed by the auto industry. For example, all new GM cars are being equipped with On-Star, which utilizes GPS technologies as well as Verizon cellular services. Furthermore, federal legislation will likely play a key role in determining the market penetration of any technology. It is possible that legislation will be passed mandating that new vehicles be equipped with some of the technologies being discussed. However, any potential legislation may take upward of 15 years to phase out older vehicles.

It will be necessary to determine how a mileage fee would be phased in. Would only new cars that come equipped with the necessary technologies be subject to the new fee, or would an effort be undertaken to retrofit the entire vehicle fleet? The State of Oregon stated that it would only take \$33 million to implement its pay-at-the-pump system, which would require a 2 percent increase in the mileage rate. However, it is presently unclear as to whether this figure includes the cost of retrofitting the entire Oregon auto fleet with the appropriate equipment or includes just service station modifications.

An additional question that will need to be answered before any technology is selected for development with a mileage-based user fee system is whether facility and even lane-specific information is to be used in determining fees. Focus group data gathered by TTI researchers in Northeast Texas indicated that there is a desire for this type of selective pricing. Focus group participants indicated that they tend to travel longer distances on county roads than city drivers on city streets, in spite of the fact that travel time is the same. These participants did not want a system that would charge them the same amount to drive a certain number of miles on an uncongested rural road as an urban driver travelling the same distance on a more congested roadway. Furthermore, participants who were involved in the ranching industry indicated that they would not want to be charged for mileage accrued while driving on private ranches and farms.

There is also the question of whether a mileage-based fee system should utilize a time-of-day component or congestion pricing. Such a system would be most likely to benefit larger urban areas and might allow these areas to implement broader congestion pricing strategies.

Global Positioning System

Current GPS technology is not all that accurate. While it might be good for determining vehicle location within zones, as was previously discussed, the technology would not be able to determine location at the facility-specific level. And while the technology is being continually improved to address many of the technology's problems, the issue of "vertical stacking" remains unresolved as of yet. In general, a GPS system should be able to eventually deal with most errors and intelligent positioning should correct illogical errors.

On-Star is based on GPS technology, so it is likely that if a mileage-based fee system were to utilize GPS components, then On-Star could be contracted to provide telemetry services. This might lower incremental costs.

Pay-at-the-Pump Configurations (the Oregon Model)

Pay-at-the-pump models would need to utilize an interface in which drivers are kept aware of how much taxable mileage they have accrued so that they are not surprised by a large bill at the time they refuel their vehicles. The Oregon model addressed this need by providing information related to distance travelled on the OBU within the vehicle. The actual charges were not displayed, as the mileage fee varied depending on the location being driven in, and the OBU was required to make contact with the central billing system to obtain the appropriate charge amounts. The Oregon system was also developed so that participating drivers were given their total mileage charge on their fuel purchase receipt.

While the system tested in Oregon was reported to be accurate, there was no exploration into potential dispute resolution strategies in the event that a driver believed that he or she had been mischarged. This is an issue that will need to be addressed as we move toward potential implementation. However, the Oregon system did take into account the fact that future users of a mileage-based user fee system might tamper with their OBUs or technology problems might prevent the transmission of mileage data from the unit to the fuel pump. In the event that this were to happen, users of an Oregon-type system would pay the fuel tax as a default charge.

One disadvantage of a pay-at-the-pump configuration is that it could potentially exclude a large segment of the auto fleet if plug-in electric vehicles experience strong market penetration. Since these vehicles would never have to be refueled at a service station, they would never have to pay a mileage fee. Therefore, if a pay-at-the-pump configuration were to be used in a mileage-based fee system, it would have to somehow charge these vehicles.

From a testing standpoint, pay-at-the-pump models are at a disadvantage in that large, franchised fuel suppliers might be unlikely to allow researchers access to their point-of-sale software, an integral element of testing a pay-at-the-pump system. Oregon encountered similar difficulties and had to partner with an independent fuel supplier with few service stations for its study.

Cellular Configurations

One of the primary factors that should be considered when examining possible cellular configurations is the potential cost of the system. For example, there will most likely be a cost associated with using the cell towers of private cellular providers, and it is likely that these providers would have to be involved in the billing process, which would further increase overall costs. However, it may in fact be better to utilize a private provider for these services, as there are already systems in place and it may be cheaper in the long run compared to having a

governmental entity set up a completely new billing system. However, there must be in place a fair dispute resolution system.

One potential drawback of a cellular-based mileage fee system is that there must be a system in place to deal with drivers who refuse to pay their bills. In a pay-at-the-pump configuration, the mileage fee is affixed to the purchase price of the fuel, but a cellular system would rely on drivers to pay their bills either by mail or through a pre-paid account. Furthermore, there is likely to be no mechanism in place to deny service for those who continually refuse to pay their bills.

VII Configurations (“Smart Roads”)

VII technologies would most likely work best in a cordon tolling situation and could be used to determine travel distances.

One of the advantages of a VII configuration is that VII technologies have proven benefits, which may increase the federal government’s willingness to invest in systems that utilize such configurations. Unfortunately, the future of federal funding in such ventures is not clear, as more research is needed.

While the configuration discussed utilized tolling gantries similar to those used by the TxTag program, there are other options for VII-based “smart road” applications. At present, radio-based technology is being developed and utilized at intersections and roadsides, and data can be downloaded from these stations at regular intervals. The State of Michigan is currently utilizing roadside information collection devices, but these devices are incapable of obtaining information on individual vehicles, which would negate any potential privacy issues.

The VII technology needed for a mileage-based user fee system is available, but auto manufacturers have been reluctant to work with government agencies. Cars are already being manufactured with tags, for assurance purposes, which could possibly be used in a VII-based mileage fee system. Retrofitting vehicles for VII compatibility may not be cost effective, however, as installing the appropriate antennas/display/wireless hardware will be difficult to accomplish for less than \$100 per vehicle.

NATIONAL SYMPOSIUM

Phase I of this research effort encompassed the planning stages of what was to be the first National Symposium on Mileage-Based User Fees. A planning committee was formed for the development of the program and was composed of:

- Ginger Goodin, Chair, Texas Transportation Institute
- Lee Munnich, Hubert H. Humphrey Institute of Public Affairs, University of Minnesota
- Robert Johns, Center for Transportation Studies, University of Minnesota

- Kenneth Buckeye, Minnesota Department of Transportation
- James Whitty, Oregon Department of Transportation
- Richard Trey Baker, Texas Transportation Institute
- Katherine Turnbull, Texas Transportation Institute

An event-planning staff was assembled to handle the actual preparations for the symposium, such as booking the location and making other types of arrangements. The planning staff included:

- Kerry Fillip, Texas Transportation Institute
- Karen Smith, Texas Transportation Institute
- Casey Dusza, Texas Transportation Institute

It was decided by the planning committee that the symposium would be held in the state capital of Austin, Texas, which was selected in large part because the symposium would be held during the Texas legislative session and it was hoped that state officials would find it convenient to attend.

The goal of the symposium was to bring together professionals in the field of mileage-based fees for the purpose of sharing information on current applications and exploring future potential as a supplement or replacement for the fuel tax. The outcome of the symposium was to be a set of recommendations defining a logical path forward as well as an identification of specific research needs. In addition to discussing current and future mileage-based user fee research and exploring various issues surrounding the concept, it was decided that attendees would be asked to consider three questions over the course of the symposium:

- What are the greatest challenges or barriers to transitioning from the fuel tax to a per-mile fee?
- What would the transition look like and who would lead?
- What additional research, testing and demonstration are needed?

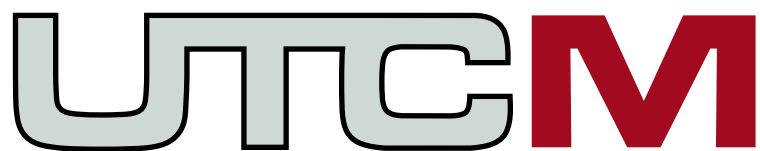
The planning committee decided that these are the three most important questions that need to be answered if mileage-based user fees are to move forward as a viable alternative to the fuel tax in terms of supporting transportation development. To facilitate thought and eventual discussion on these questions, the conference planning committee arranged for Robert Johns of the Center for Transportation Studies to conduct a conversation circle on the last day of the symposium. In this moderated discussion format, each question would be posed by the moderator, and symposium participants would be invited to speak on it one at a time.

In terms of potential attendees, it was decided by the planning committee to target seven groups:

- Academics – To aid in identifying research needs

- Professionals (from numerous states) – To assist in identifying institutional issues
- Consultants – To provide feedback on both institutional and technology issues
- Legislators – To provide perspective on institutional issues and possible barriers to implementation
- International practitioners – To provide insight on similar international efforts
- Stakeholder groups – To provide the opportunity to give feedback on potential resistance/acceptance and to outline possible outreach strategies

The first day of the symposium would consist of panels discussing a variety of issues. These would include a discussion of U.S. pilot projects, a discussion on the federal perspective from the Federal Highway Administration, a luncheon address from a representative of the National Surface Transportation Infrastructure Finance Commission, an institutional issues pane, a public acceptance issues panel, and a technology panel. The second day would begin with a panel on state and local perspectives where representatives from state and local entities would speak from their perspectives on transportation finance in general and mileage-based user fees specifically, and a stakeholder panel that would bring together representatives of various road user groups to discuss the same topics. The second day would then close with the aforementioned discussion circle.



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