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Mileage-Based User Fees: Defining a Path toward Implementation Phase 2: An Assessment of Institutional Issues

Final Report

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16. Abstract

This report documents the 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).

This document covers the institutional assessment portion of the research effort. It was conducted in conjunction with the technology assessment and involved the study of various user fee frameworks in place throughout the United States and an analysis of the various institutional issues to be considered with mileage-based user fee development, implementation and eventual administration. This report is meant to serve as a tool for policy makers and other interested parties who are considering mileage-based user fees as a potential means of generating transportation related funding and wish to gain a better understanding of the issues surrounding them.

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Mileage-Based User Fees – Defining a Path toward Implementation

Phase 2: An Assessment of Institutional Issues

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EXECUTIVE SUMMARY

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

- Revenues from a mileage-based fee system would not erode as vehicular fuel efficiencies increase.
- Revenues can be captured from vehicles that do not require fossil fuels to operate.
- They 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 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 institutional issues that would be involved in a transition to these fees as the primary source of funding for transportation development. There has also not been an evaluation of the strategies that might be employed in deploying these systems at the state and/or federal level from an administrative perspective. This report explores these issues.

Researchers first conducted an analysis of the Real lD 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 level;
- Federal financial assistance if necessary.

Researchers next examined various other alternatives to the fuel tax so as to provide for the broadest articulation of transportation financing issues. These alternative strategies included:

- Indexing and/or Increasing the Fuel Tax
- Addressing Diversions
- Performance Based Funding Allocation
- Increasing Private Sector Involvement
- Targeted Tolling

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. A summary of this discussion is provided as Appendix A.

Next, through the University Transportation Center for Mobility (UTCM), researchers organized and hosted the first Symposium on mileage Based User Fees in Austin, Texas on April 14th and 15th. 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. A summary of the symposium discussions is attached as Appendix B.

This report provides discussion on the institutional issues that were highlighted in the course of these research activities. With regards to developing and implementing mileage-based user fees, the following recurring issues were deemed the most pressing and are covered in the most detail:

- The need to develop and clearly articulate program goals
- Public acceptance
- The lack of national policy direction
- Legislation
- Equity considerations
- System architecture
- Program structure
- Potential public and private sector roles
- Administration issues
- Potential implementation strategies

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 the use of the national roadway network, such as fees based on vehicle miles traveled (VMT) or "mileage" fees, are among primary contenders as a full-scale replacement. The National Surface Transportation Infrastructure Financing Commission, the Nation 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 be 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 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, and
- issues of public acceptance.

In looking at these issues, Texas Transportation Institute (TTI) researchers used 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 represent 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. A summary of the team's discussion appears in Appendix A.

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 University Transportation Center for Mobility (UTCM) hosted a symposium on mileage-based user fees in April 2009. Symposium attendees were asked to consider three questions:

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

At the conclusion of the symposium a discussion was held to examine potential answers to these three questions. A summary of this discussion appears in Appendix B.

Similar Initiatives

A transition to mileage-based user fees represents a potentially monumental shift in the way that the federal government and states fund transportation projects. Depending on how they are implemented and ultimately structured, various forces will work to impede transition. Researchers began by examining two programs that represent a fundamental shift from the status quo. Federal mandates and programs were examined, as opposed to state programs, because interaction with policy makers and transportation experts has revealed that direction from the federal government is desirable at some point if a mileage-fee system is to be implemented in a manner that sustains transportation development for the nation as a whole and is interoperable between the various states.

Real ID

The Real ID program is important to look at because, like a potential transition to mileage-based user fees, it affects long-standing and well-established state laws, protocols, and policies. It also, like a mileage-based fee system, would require

substantial investments by states and the federal government and extensive coordination to attain its stated goals. It is discussed here for these reasons as well as the fact that it represents a true "top-down" approach to program implementation, in that the federal government was responsible for formulating program goals and mandating implementation by the states.

The Real ID Act (Real ID) was passed by Congress in 2005 as a means of creating national standards for the issuance of state driver's licenses and other forms of identification. States were required to meet the various requirements of the act by 2008 if identification cards issued by their various subordinate jurisdictions were to be accepted as valid by the federal government. Currently, all 50 states have received extensions, and the deadline to comply with the Real ID Act is December 31, 2009 (1). States may also apply to extend the deadline to May 10, 2011, but as of May 16, 2009, 23 states have passed legislation rejecting the program (2).

The Real ID program has suffered many setbacks. A joint report by the National Governors Association, the National Conference of State Legislators, and the American Association of Motor Vehicle Administrators concluded that the Real ID program "presents significant operational and fiscal challenges to states and the federal government" (3). The report found that it would be impossible for states to implement the Real ID Act by the specified deadline because states would not be able to reprocess all current license holders before the deadline. States would need time to adopt new legislation, receive federal funding, and follow procurement processes in order to implement the program. The report went on to recommend that, in addition to gradually implementing the program, states should be able to grandfather people who already have driver's licenses and identification cards for a set period of time in order to ease the additional burden that motor vehicle offices will face.

The report also found that the federal government had not officially defined the purpose and the parameters of the Real ID Act. For example, depending on how the purpose of the Real ID Act is interpreted, people who do not drive and choose not to get an identification card could be denied access to federal buildings, post offices, or even voting stations during federal elections. It was recommended that the federal government define two of the components included in Real ID cards—address of principal residence and full legal name—so that they are consistently defined across all states.

The report recommended that the federal government assist states in developing and updating the databases that must be used to implement the Real ID system. The Real ID Act requires five verification systems to complete the necessary processes and ensure compliance. The development of new systems and the modernization of older systems would require considerable time and money, with states indicating that the federal government should fund the development of these databases and the states' costs to use them.

It should be noted that the current leadership of the Department of Homeland Security (DHS) is looking to amend, if not outright repeal, the Real ID Act to address many of the program's criticisms. In a statement made to the Anti-Defamation League in April 2009, DHS Secretary Janet Napolitano stated that DHS is looking at turning Real ID into a program that "pivots off of the driver's license but accomplishes some of the same goals" (4). This seems to indicate that DHS is seeking to build the program off of existing state identification programs, perhaps without direct federal mandating of standards and practices.

The International Fuel Tax Agreement (IFTA)

The IFTA represents more of a "ground-up" approach to program reform since it was initiated at the state level and was later mandated by the federal government. It was initiated by the states of Arizona, Iowa, and Washington in 1983 in an attempt to help coordinate the collection of fuel taxes from commercial vehicle carriers. Up until this time carriers were more often than not required to file different tax forms for the various jurisdictions they operated in. In 1984, Congress supported the formation of the National Governors Association's Working Group on State Motor Carrier Procedures, which proposed a "Model Base State Fuel Tax Reporting Agreement" based on the initial IFTA agreement and the Regional Fuel Tax Agreement used by several northeastern states. By 1987, six states had adopted the National Governors Association model, and by 1990, 16 states had joined the IFTA. In 1991, the Intermodal Surface Transportation Efficiency Act (ISTEA) acknowledged these state agreements for commercial vehicle registration and fuel tax reporting and authorized the Federal Highway Administration (FHWA) to fund a working group to assist the International Registration Plan and the IFTA. ISTEA also provided incentives for states to participate in the IFTA by prohibiting states from imposing fuel tax reporting requirements or requiring fuel tax payments that were not in conformity with the IFTA (5).

Furthermore, ISTEA gave the states flexibility in deciding how to coordinate fuel tax reporting. However, three core provisions needed to be met in an interstate compact:

- The compact needed to incorporate the concept of a base jurisdiction, which would allow motor carriers to pay appropriate fees to a single jurisdiction.
- The compact needed to incorporate a uniform definition of "taxpayer."
- States needed to retain the right to determine tax rates and exemptions and to be able to exercise other substantive tax authorities.

The IFTA worked to reduce transaction costs for participating states by creating an organization (IFTA, Inc.) that acted as a clearinghouse for information and provided oversight of state adherence. Furthermore, the agreement helped to establish uniform policies across states, further reducing transaction costs and inducing states to participate in the agreement (5).

The IFTA was successful for many reasons. First, there was a consensus that diesel fuel tax revenues should be apportioned among the states based on the actual mileage traveled in those states. Second, the "base jurisdiction" concept worked to reduce compliance costs for the trucking industry and reduced auditing costs for the states. Third, the IFTA was and remains a dynamic agreement that can be modified as needs arise (5).

Conclusions and Recommendations

Based on national experience with the IFTA and Real ID Act, the following recommendations are made with regards to implementing mileage-based user fees.

Define Program Goals

The failure to articulate various program goals and definitions led to confusion on the part of states in the implementation of the Real ID program. In the absence of concrete program definition, states were left to divine various aspects of the program, which negated the interoperability between state systems, one of the explicit goals of the program. With regards to mileage-based fees, it may therefore be desirable for the federal government to define, in terms of system architecture, the various components of mileage-based user fees so that state interoperability can be assured from the outset of administrative system development. These system architecture components will be discussed in more detail later in this report.

The federal government may not, however, necessarily have to articulate program goals so long as a mechanism is provided that allows for cooperative program development among the states. IFTA, Inc., was instrumental in serving as a means of coordinating fuel tax reporting and revenue distribution by state governments, and a similar model may be desirable if the federal government wishes to refrain from articulating various program goals and definitions.

Set Attainable Time Frames

The Real ID program suffered from unrealistic time requirements. It does not appear that the federal government accounted for the time that would be required to pass necessary legislation at the state level and did not account for the need to develop new administrative procedures. This indicates that any new program that requires such wide-ranging changes must be implemented slowly to allow states to make the necessary adjustments to achieve compliance. States and appropriate sub-agencies should be involved in the policy-making process from the start and remain informed as to program goals in order to guide the development of deadlines and benchmarks. For example, if deadlines are to be set for the adoption and implementation of a mileage-based alternative to the fuel tax, they should be established with the input of the states and state agencies that would responsible for administering the program.

If implementation of a mileage-based user fee system is to be gradual, then time frames may be flexible, so long as the federal steps are taken to ensure that this gradual implementation may occur without disruption. In barring states from imposing fuel tax reporting requirements or requiring fuel tax payments that were not in conformity with the IFTA, the federal government helped prevent the development of state policies that were detrimental to program goals, even as participation in the IFTA program remained optional.

Allow for Flexibility in Program Administration at the State and Local Levels

The Real ID program suffered from the top-down imposition of standards and practices that presented a substantial burden on states and state agencies. And while participation in the IFTA program was also, in a sense, mandated by Congress, states were subjected to only meeting general requirements as established in statute. Furthermore, in terms of developing more specific program administration practices and policies, the IFTA and IFTA, Inc., provided a collaborative and dynamic environment for the development of these policies.

Provide Federal Financial Assistance to States If Necessary

Developing administrative protocols for the eventual implementation of mileage-based user fees could potentially require the development of massive databases for managing driver accounts. As it now stands, most states generally only process fuel tax receipts from at most a few hundred payers. In a mileage-based fee system that number would increase exponentially, imposing a significant cost on any implementing entities. The Real ID program has suffered in large part because numerous state agencies lack the financial ability to develop new databases and/or update existing databases. Therefore, if mileage-based user fees are mandated from the federal government at some point in the future, it may be necessary for the federal government to provide assistance so that states may take the necessary steps to ensure that such systems are rolled out in a timely and efficient manner.

Alternative Strategies to Mileage-Based User Fees

Focus group data have shown that the general public may view threats to transportation financing more in terms of the need for more responsible spending and less in terms of threats to the revenue base. For example, Minnesota focus groups showed that the public has yet to make a connection between increasing vehicular fuel efficiencies and declining future revenues (6), while focus groups conducted in Texas showed that diversions to non-road maintenance and development programs were deemed as a much larger problem than deficiencies with the fuel tax (7).

Focus group data have also shown that the public may view mileage-based user fees as being too costly and complex relative to the fuel tax (6, 7). As such, they are viewed as being too costly an alternative. Therefore, it is likely that the public will be resistant to large-scale changes without first attempting “easy fixes.” States and the federal

government, in developing mileage-based alternatives, may therefore do well to attempt these short-term easy fixes in addition to implementing mileage-based fee systems.

Indexing and/or Increasing the Fuel Tax

Simply increasing and/or indexing the fuel tax to some measure of inflation, such as a highway construction cost index or the consumer price index, is perhaps the most straightforward solution to the near-term insolvency of the Highway Trust Fund (HTF). The National Surface Transportation Infrastructure Financing Committee (NSTIFC) has recommended a $0.10 increase in the federal gasoline tax, a $0.15 increase in the federal diesel tax, a doubling of the federal heavy vehicle use tax (HVUT), and measures to index these and other special fuels taxes in conjunction with the upcoming federal transportation reauthorization cycle (8).

Several state legislatures have introduced legislation aimed at increasing state fuel taxes and, in some cases, vehicle registration fees and other road user fees. However, reluctance to raise taxes during a national recession has killed much of this legislation. The State of Hawaii, for example, failed to pass an increase in the state's fuel tax, vehicle weight tax, registration fees, and rental vehicle surcharges even as legislators attempted to structure the legislation so that the increases would go into effect only after the state experienced two consecutive quarters of at least 1 percent economic growth (9). Iowa Governor Chet Culver cited the economic recession and a desire not to raise taxes in his threat to veto legislation that would have raised that state's fuel tax rate, effectively killing the measure (10). Proposals for increasing fuel taxes and other state transportation fees have been met with similar criticism in New Hampshire, Nevada, Texas, and Vermont. Recent federal economic recovery funds have hampered many efforts at passing state-level fee increases as legislators have indicated that the infusion of federal funds has mitigated the need to increase state funding sources.

To account for inflation, it may be beneficial to change the fuel tax levy to the purchase price of the fuel and not the physical amount purchased. A number of states have tried this approach including California, Georgia, Hawaii, Illinois, Indiana, Michigan, and New York. The legislature of the state of Louisiana was, until recently, considering a measure that would allow for that state's fuel tax to increase with inflation. While doing this would help fuel tax revenues keep pace with inflation, it would also increase the volatility of fuel tax revenues (since revenues would fluctuate based on fuel prices to an even greater extent) and would require changing federal and most state legislation dealing with fuel taxes. Furthermore, such a measure may generate significant public resistance because consumers would be forced to pay more in taxes as fuel prices escalate.

Addressing Diversions

Diversions may be generally defined as providing funding from fuel tax revenues for uses unrelated to roadway use. In Texas, one-quarter of gross state fuel tax revenues

are dedicated to the state's general education fund. At the federal level, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) authorized $52.6 billion in funding for transit services, which may be argued to be a diversion.

Regardless of the magnitude of funding diversions, or the arguments made for their appropriateness, the public has generally indicated that diversions are wasteful and should thus be eliminated or at least reduced prior to undertaking a transition to a new revenue-generating mechanism. Recent and highly publicized instances of wasteful spending on the part of federal legislators have compounded the matter. For example, in a northeast Texas focus groups, the now notorious Alaskan "Bridge to Nowhere" was cited by numerous participants as evidence that existing fuel tax revenues are not being used wisely, and that transportation financing reform should begin in the federal and state legislatures. Efforts by state legislatures to curb diversions to non-roadway uses have been minimal and, for the most part, unsuccessful.

Performance-Based Funding Allocation

Fuel tax revenues are not related to where vehicles are driven or the cost of maintaining and expanding the roads being used. Consequently, the planning and prioritization of projects depend more on administrative and political choices and not on where revenue is generated (8). Numerous factors are taken into account, including economic development and environmental issues, when deciding which projects receive funding, which reduces the efficiency with which revenues are distributed. The NSTIFC has stated that the federal government needs to take into account state and local assessments of transportation needs and that financing policies should be coordinated with related state and local policies. As such, reforming the system by which transportation funds are allocated and apportioned to the states is a very popular notion.

There has been consideration at the federal level for establishing a national infrastructure financing entity such as a National Infrastructure Bank or National Infrastructure Reinvestment Corporation. The NSTIFC noted in its final report that if such an entity were to be established, it should be structured so that it addresses "actual funding and credit market gaps and targets assistance to projects that are essential to the national network but lack access to sufficient resources."

The Bipartisan Policy Center (BPC) has stated that federal investment in transportation programs should be centered on "maximizing valuable investments where the returns to society are measured and optimized" and notes that the current system of federal transportation financing fails to take advantage of the fact that system performance can be directly influenced by how users pay for it (11). While stopping short of outright endorsement of mileage-based user fees as a preferred alternative financing mechanism, the BPC has recommended the development, testing, and implementation of more direct mechanisms for linking revenue collection with system use and impacts.

The BPC has also recommended that all federal transportation programs be consolidated into two categories: a formula-based systems preservation program and a competitive capacity expansion program. The performance-based program would include programs for sustainment of national connectivity, sustainment of core assets, an essential asset program, and a performance bonus program. The competitive expansion program would include programs for the improvement of federal connections and the improvement of core transportation. This proposal would reduce the number of federal transportation programs from 108 to six. As part of the process, the BPC recommends that federal apportionment formulas be simplified and that metropolitan planning organizations be given more authority in setting spending priorities (11).

The BPC's recommendations for 21st century transportation policy include (11):

- assuring that the nation's transportation networks are robust and flexible enough to provide for the efficient movement of people and goods while handling growing demands on our ports, trade corridors, and urban centers;
- implementing effective strategies for addressing the growing transportation problems in major metropolitan areas;
- addressing the continued and still growing dependence on petroleum as America's primary transport fuel—and the economic and geopolitical insecurity that comes with this dependence;
- dramatically reducing the transportation sector's contribution to global climate change;
- confronting still unacceptable levels of mortality and injury on the nation's highways; and
- finally—running through all of these issues—ensuring equity, which is the proposition that no one should be excluded from the economic benefits brought about by transportation systems.

Increasing Private-Sector Involvement

One of the aforementioned criticisms of the fuel tax as a revenue-generating mechanism and the current transportation financing system in general is that funding is not allocated in an efficient manner. Political imperatives, rather than system needs, often drive investment, and the various funding formulas and appropriations processes that dictate funding to the states are often based on factors unrelated to actual use of the system. Many have called for an increase in private-sector involvement and the utilization of market forces that would bring more efficient allocation of funding.

While this process is, in and of itself, fraught with controversy and public acceptance issues, steps have already been undertaken, and many states have undertaken partnerships with private entities for the provision of roadway services. Public-private partnerships (PPPs) are the most common form of this venture, where private entities provide a substantial upfront capital payment in exchange for the rights to build,

maintain, and/or administer tolled facilities. There are currently 34 states and one territory that have enacted legislation enabling these partnerships. However, each PPP has its own unique suitability criteria, specific for the projects upon which they are founded. PPPs may not therefore be desirable in all cases.

Targeted Tolling

Targeted tolling refers to the pricing of specific facilities that may be administered by local, state, or even federal agencies. Such approaches are being used more and more across the nation, especially in highly congested urban areas with a multitude of toll-viable projects. Much of the focus of debate with regards to reforming the nature of transportation finance is on the need to direct more funding to urban areas with corridors and facilities that are of national importance. A greater reliance on targeted tolling may be a useful mechanism because it addresses many of the equity concerns that might be raised by rural drivers who do not feel they should have to pay more in taxes for infrastructure development that is most likely to occur in larger, urbanized areas.

Before the passage of the Federal Aid Highway Act of 1956, many major highways and tunnels were funded by targeted tolling. This trend declined with the development of the HTF and its reliance on broad-based fuel taxes for funding transportation development. However, in the past decade tolled facilities have accounted for as much as one-third of all new limited access highway lane miles built in the United States (8).

However, tolling entails a considerable amount of public resistance, particularly with regards to the imposition of tolls on existing freeways. There are currently 277 state and local toll roads, bridges and tunnels in 32 states, but a very limited number that were non-tolled lanes converted to tolled lanes. Despite the availability of funds and federal legislation authorizing such activities, tolling of existing freeway lanes is limited primarily to HOV-to-HOT lane conversion projects.

POLICY GOALS OF MILEAGE-BASED USER FEE SYSTEMS

The overall goals of a mileage-based user fee system will drive the development of system policies, which in turn will determine system architecture. The primary objective of a mileage-based fee may vary depending on the implementing entity or entities. Goals may be general, such as to provide a fair, stable source of user-generated revenue to support the transportation system (12). Or, they may specific, such as providing for maintenance and upkeep of specific facilities or mitigating urban peak hour congestion. At the specific level, various goals may be complementary. For example, reducing peak demand may also reduce roadway wear and tear, improve safety, and improve the environment.

Stated program goals and objectives will drive the development of specific pricing policies for achieving those goals. Therefore, at the most basic level, a mileage-based

fee system will charge for use of the highway system in terms of mileage so as to collect revenues, but other policy goals will result in the introduction of new pricing elements. Variable pricing based on time of day, in addition to distance traveled, will help to achieve policy goals oriented toward congestion reduction. Policy goals oriented around improving air quality or other environmental goals might introduce pricing that varies on vehicular emissions class, vehicle weight, age, and/or fuel efficiency. Policies that are directed toward specific geographic areas will likely require location- and/or facility-specific fees to be assessed. Some examples of possible revenue-oriented goals include:

- preserving the existing revenue base against future erosion,
- collecting all user costs,
- increasing existing revenues, and
- supplementing fuel tax revenue.

Secondary goals may be classified as those that fall outside of simple revenue collection but may be tied to primary goals. Some examples include:

- improving enforcement and compliance,
- streamlining regulatory processes (e.g., automating toll collection),
- reducing road wear,
- improving safety,
- optimizing use of capacity,
- reducing demand (by reducing trips, changing trip times, or changing trip modes), and
- reducing environmental impacts.

Mileage-based user fees have the potential to generate significant amounts of data with regards to driver behavior that can be used in achieving various secondary goals outside of revenue generation. For example, the Puget Sound Regional Council's Traffic Choices study was aimed at determining how drivers would react to differential pricing applied to different facilities, with peak period travel and travel on freeways having a higher per-mile fee than travel on arterials or in the off-peak period. Fairly detailed travel information was required. PSRC was able to understand driver responses to tolling in terms of changes in trip making and trip chaining, and was able to understand the elasticity of travel in response to price signals. This type of data may be useful in travel forecasting models used in the development of long-range transportation plans that incorporate pricing elements. PSRC has noted that precise locational data might not necessarily be required for such a detailed mileage-fee system, but some locational and facility-specific data will be required.

It is estimated that the during its operation the London congestion toll program eliminated approximately 60,000 vehicle trips into the congestion zone per day, with about 50 to 60 percent of these trips shifting to public transit. PSRC estimated that

system-wide tolling would result in a 12 percent decrease in total VMT over the whole Puget Sound region. Furthermore, PSRC estimates that the benefits from travel time savings over a 30-year implementation of area-wide pricing would be about $37 billion, with a benefit-to-cost ratio of over 6 (13). It is estimated that the Austroads Intelligent Access (IAP) program in Australia will generate $118 million to $212 million per year with an estimated benefit-to-cost ratio of between 3.1:1 to 5.0:1 (14).

International mileage-based fee systems have a wide array of policy goals and objectives. Table 1 shows the most relevant goals and objectives for the major types of mileage-fee systems deployed around the world as projects surveyed by the University of California, Los Angeles (UCLA) Institute of Transportation Studies. "Primary" goals are those that were found in most or all of the projects surveyed, while "secondary" goals were identified in only a minority of the projects surveyed.

Table 1: International User Fee System Pricing and Policy Objectives

Policy/Pricing Objectives	Weight-Distance Truck Tolls	Distance-Based User Fees	Cost Variabilization
Preserve Revenue		Primary	Secondary
Charge Equitable Costs	Primary	Primary	Primary
Charge External Users	Primary	Secondary	
Enforcement	Secondary		
Efficient Regulation	Secondary		
Reduce Road Wear	Secondary		
Improve Safety	Secondary	Secondary	
Optimize Capacity		Primary (Intl.)	Secondary
Reduce Demand	Secondary	Primary (Intl.)	Primary
Improve Environment	Secondary	Primary (Intl.)	

Source: Sorenson and Taylor, 2005 (14)

Primary policy goals labeled as "Intl." were considered of primary importance for international projects but of only secondary importance for application within the United States. All of these particular policy goals and objectives relate to international *distance-based* user fees, which, of the three types of international project types surveyed, most resemble the mileage-based fee systems under consideration domestically.

Perhaps the primary goal that needs to be articulated is: what is the purpose of the fee? Is it meant to replace or supplement the fuel tax? Or, should it act as a replacement for some other tax such as registration fees? Registration fees provided almost 15 percent of the revenue for the Texas State Highway Fund (15), yet they are tied less to use than the fuel tax. Perhaps these types of fees could be modified to account for use. Determining the ultimate role of the fee in the overall transportation financing

framework will determine how subsequent primary and secondary policy goals and ultimately the system architecture are structured.

The NSTIFC has recommended that with the implementation of a mileage-based user fee system, federal fuel taxes should be "reduced and ultimately eliminated as the primary mechanism for funding the surface transportation system" (8). The commission noted, however, that there is a role for fuel taxes as a mechanism for reducing carbon emissions, and that if the fuel tax is kept in place for this purpose, then a portion of the revenues should be dedicated to the HTF for carbon-reducing transportation strategies.

Examples of User Fee Policy Systems

The German Toll Collect heavy vehicle charging system is limited by various European Union directives. For example, tolls may only be levied on trucks and vehicles of over 12 tons, only motorways can be tolled, and tolls are can only be leveraged based on the direct capital and operating costs imposed by truck traffic. The main revenue objectives of the system are to recover system costs associated with truck use and to finance ongoing maintenance and improvements (14). Other system goals include environmental mitigation through price-induced shifts to lower emission vehicles and mode shift to rail, and encouraging more efficient use of vehicle stock.

Because the basis of revenue collection under the Toll Collect system is rooted in recovering various user costs imposed on certain roadways, and not simply generating revenues, categories of different costs were developed in order to guide fee assessment. These include (14):

- Causality: This aspect of cost is based on the operational parameters of the vehicles participating in the program and includes factors such as axle loads.
- Specificity: This aspect is applied with respect to the design of roads and may vary based on factors such as the thickness of roadway layers, curvature, and width of lanes.
- Fairness: A fairness component is applied to minimize cross subsidization between user categories for the fair allocation of pure common costs.

The primary goal of the Swiss heavy vehicle fee (HVF) truck program was to induce mode shift from roadway-based freight to rail. The system's pricing policies are composed of three elements:

- a performance-related fee that allocates the cost of freight transport on roads according to a user/polluter pays principle,
- a drive to modernize railway infrastructure through voter-approved investments, and
- a railway reform act aimed at increasing productivity and competitiveness among rail companies.

The fee applied under the Swiss HVF program is dependent on the distance driven, the maximum laden weight of the vehicle, and the vehicular emissions class. Revenues are used primarily to finance railway infrastructure.

Use of Revenues

Policies relating to how revenues generated under a mileage-based fee mechanism will depend on the overall goals of the system itself. If the goal is to replace the fuel tax, then revenues will most likely be dedicated to state and federal transportation-related trust fund accounts. However, if more specific goals are articulated, such as covering maintenance costs on specific roadways or mitigating the impact of congestion on the environment, then more specific policies will have to be developed to determine how revenues are to be allocated. While this is dependent on the overall policy goals of the system, it will also be heavily dependent on the framework adopted with regards to local retention of funds.

The means by which revenues are distributed under a mileage-based fee system could potentially have very profound effects on the fundamental relationship between the federal government and the states with regards to transportation financing. The federal government's role as "redistributor" of transportation funding can be justified by the notion that the national provision of transportation "goods" should be handled in a centralized manner so as to ensure equal "consumption" of those goods for all users. However, it may also be argued that the provision of transportation goods and services may best be delivered at the state and local levels because these services can be differentiated based on local demands (16). Mileage-based fee systems can be structured to allow for the retention of regionally generated funds, which would bypass the traditional federally oriented (and, in many cases, state-level) apportionment processes. If such a system were to be developed and implemented nationwide, where revenue generation can be tied to specific areas and/or facilities, then what are the implications for the role of the federal government in allocating revenues?

Ensuring that revenues are used to maintain and/or expand roadway networks will be crucial in gaining the support of the trucking industry for these types of proposals. While the trucking industry has indicated that it is already heavily taxed, it is willing to pay more if it can be assured that these additional revenues will not be diverted to non-roadway uses (13).

MILEAGE-BASED USER FEE IMPLEMENTATION CONSIDERATIONS

There are many barriers facing the implementation and potential transition to mileage-based user fees as a primary transportation financing mechanism. These include:

- public acceptance,
- a need for direction,

- legislation,
- equity considerations,
- system architecture,
- program structure,
- public and private roles,
- administration, and
- possible implementation strategies.

These issues will likely need to be addressed before implementation of a mileage-based fee system can occur. Some of these issues, such as issues of public acceptance, can be addressed through the definition of program goals and the establishment of program policies. Direction, in terms of establishing an environment for system development, will need to be set prior to program definition. Legislation requirements will depend a great deal on how the direction is set with regards to system development as well as program goals.

Public Acceptance

The public acceptability of an alternate transportation financing mechanism will depend a great deal on the acceptability of that which it is replacing. However, this acceptability will in turn depend on knowledge, and focus group research by the Minnesota Department of Transportation and the Texas Transportation Institute has shown that the public does not think about the fuel tax very much, and participants in these focus groups were generally unaware of how much they paid in fuel taxes at any given time (6, 7). This presents a significant challenge because mileage-based fees present a considerable departure from the system that the public is accustomed to. Public interaction with regards to mileage-based fees has been characterized by uneasiness with the system's complexity and doubts about the necessity of abandoning the fuel tax. While these participants have indicated that fees based on actual use are indeed a fair way of financing transportation development, several issues have tended to override actual support for their implementation.

Privacy

Privacy is likely to be one of, if not the most, salient aspects of a potential mileage-based user fee system in terms of public acceptance. While there are potential system architectures that could be deployed that are not technology dependent, most applications under consideration would involve some form of global positioning system (GPS) technology to determine vehicle location. It is this potential reliance on GPS that causes much of the public's concern.

Privacy concerns may be expressed in a number of ways. The most dominant notion is that of being "tracked." Research in Northeast Texas has shown that the idea of providing governmental agencies with information regarding specific movements is not well accepted. When participants were presented with information detailing how the

Oregon Department of Transportation protected privacy during its Road User Fee Pilot Study, namely by relying on data pertaining to "zones" as opposed to location-specific data, many of these concerns were reduced. However, there still existed a strong sentiment that government, at both the state and federal levels, should not be given access to any information on travel behavior, even if it takes the form of aggregate mileage based on travel within zones (7). This indicates that regardless of the steps taken to ensure driver privacy, the public will still have concerns with regards to state and federal agencies collecting any form of driver behavior information.

Given that privacy interests with regards to driver data will remain a concern regardless of system architecture, the best course of action will likely be to address and mitigate the most pressing of these concerns. As previously noted, the idea of being tracked is perhaps the most troubling aspect of a potential mileage-based user fee system. Systems that reduce or eliminate the ability of government to determine specific vehicle location therefore have the highest probability of attaining the highest levels of public acceptance. By establishing a zone-based system that only requires general location data, ODOT helped to assure driver privacy while still being able to accurately determine appropriate fees and not charge for miles driven outside of the charging area. Mileage only accrued within pre-established zones, and trip-specific data were not needed for the calculation of fees (17). This type of system was seen as preferable by participants in TTI's Northeast Texas study (7). In contrast, the system tested by the Puget Sound Regional Council by definition relied on facility-specific location data, as mileage fees varied based on the route taken and the time of day traveled. Such a system is more likely to generate significant public resistance; however, the level of detail it provides in terms of driver behavior allows for the deployment of more nuanced pricing applications.

It should be noted that Oregon's onboard units only received GPS signals and did not relay information back to the satellite. In fact, GPS based navigational systems in general do not require a signal to be sent back to the satellite in order to determine location. The onboard units used in the University of Iowa's road user fee assessment study only retain location data for the minimal time necessary to calculate fee charges. All charges are computed on the vehicle itself, and only the aggregated mileage charges are transmitted to the network operation center (13). Thus, it is impossible for either system to "track" participants.

There are numerous ways in which policies can be developed to protect drivers' rights. For example, the European Union has mandated that traveler information is not to be transmitted outside the vehicle in any road user charge system. Thus, fee calculation occurs in the vehicle, and only fee totals are transmitted for billing purposes. Representatives of the Federal Highway Administration have stated that in terms of

collecting federal tax revenues, there is really no need for the government to collect location-specific information or otherwise track motorists (13). If this is indeed the case, then a federally mandated mileage-based user fee program might enjoy more public acceptance than a system implemented at the state or local level that may rely on more detailed location information.

Establishing Need

Unless the public (and elected public officials for that matter) believe that existing remedies for addressing problems with transportation financing have been adequately used, it is unlikely that new pricing policies will receive much public or political support. Much of the public resistance with regards to implementing mileage-based fee systems is therefore likely to be rooted in the notion that there is no need for any alternatives or supplements to the fuel tax because there are numerous "easy fixes" that would not require the imposition of a potentially onerous fee system. Minnesota focus group research showed that the public has yet to make a connection between increasing fuel efficiency and declining future tax revenues (6). Public acceptance research conducted in Northeast Texas revealed that threats to long-term transportation financing have more to do with irresponsible spending on the part of federal and state policy makers and less to do with the fuel tax's declining revenue base (7). It is likely that with regards to public acceptance of mileage-based fee systems, there is not a well-established need for them in the view of the public.

TTI researchers, in their public outreach efforts, endeavored to provide participants with basic information regarding transportation financing. Participants were given information on the mechanics of the fuel tax, the various factors working to undermine its long-range sustainability, basic information on various alternatives including but not limited to mileage-based fees, and the basic process by which fuel tax revenues are apportioned by the federal government and then spent by the respective states. In general, providing this information did not necessarily lead to broad support for fees based on mileage as a potential replacement for the fuel tax, but it did increase the willingness of participants to discuss options for addressing threats to transportation funding and financing outside of merely increasing and/or indexing the fuel tax. Thus, it is recommended that education and outreach efforts, to both public and elected officials, be pursued prior to the development of any mileage-based user fee systems.

A Need for Direction

A "lack of political will" and a "lack of national direction" have been cited as major political impediments with regards to reforming transportation financing practices (13). The federal government has yet to articulate a concrete position on how or even if mileage-based fee mechanisms should be pursued. In the absence of this guidance, states such as Oregon have already begun the process of developing implementation plans. However, there is the possibility that multiple state-based systems will not be interoperable, complicating efforts to develop a nationwide system. But even with this

potentiality, there is no strong consensus as to what extent federal guidance will be necessary. Development of interoperable state-based systems could proceed so long as efforts are coordinated in some fashion.

Specifically, a need for federal direction has been noted in the area of technology standards, especially if a national mileage-based fee system is to be developed that would allow states and subordinate governmental agencies to develop systems that could "piggyback" off the larger system. If this is to occur, interoperability between state and federal systems will need to be assured, and absent a coalition of state and local stakeholders to guide system development, direction from the federal government with regards to technology standards will be necessary.

The potentially high capital costs associated with a transition to mileage-based fees are an indicator to many of the need for federal assistance in addition to federal guidance (13). Again, lessons learned from the Real ID program indicate that if substantial administrative development is needed by the states, then federal assistance may be necessary.

Development of these types of fee systems can occur at the state level without federal oversight and program guidance, as was illustrated with initial efforts toward integrating diesel fuel tax payment and apportionment processes under the IFTA. However, there does not currently exist a well-organized coalition to pursue implementation of a mileage-based fee system. As has been previously noted, much of the success of the IFTA and the failure of Real ID has depended on the organization of stakeholders.

As part of the development of the Austroads IAP program, extensive outreach was conducted to stakeholders in order to ensure broad program participation. Potential private-sector IAP service providers noted that several key tasks would need to be undertaken by the government in setting up the program. These include (14):

- providing a clear, concise, and consistent certification and auditing regime;
- providing standards for accuracy and evidence of tampering;
- providing government geographical information system (GIS) map data;
- ensuring a stable regulatory environment, where all relevant issues have been tested in court;
- ensuring that any overhanging public policy issues are capable of being settled; and
- setting up clear communication arrangements and well-defined roles between jurisdictions and service providers.

Furthermore, freight industry stakeholders indicated that the following issues would need to be addressed to facilitate system adoption:

- ensuring the security and protection of commercial in-confidence information held by IAP service providers,
- ensuring consistency in the approach for application and enforcement of IAP operators across participating jurisdictions,
- ensuring that jurisdictions continued to target non-IAP operators through enforcement and did not treat IAP operators as "easy enforcement targets," and
- ensuring that the IAP would not be treated as a revenue raiser through enforcement of minor breaches that would be more readily detectable.

Legislation

In many cases, setting up mileage-based user fees so that they meet certain program goals will require legislation. For example, in Texas the only revenues specifically dedicated to transportation are fuel tax revenues. All other types of state revenues must first be deposited in the state's General Fund (GF) where they are then apportioned to various state programs. Therefore, if the State of Texas were to implement a mileage-based user fee, and if those funds were intended to be dedicated to transportation and only transportation-related programs, then a constitutional amendment would be required to ensure that revenues would not be diverted at the whim of legislators during state budgeting processes. It is likely that other states will need to take similar legislative action in order to ensure that a mileage-based fee system can operate as desired.

States are generally free to impose taxes as they see fit so long as they do not run afoul of the Commerce Clause of the U.S. Constitution and do not seek to regulate interstate commerce, a right that is reserved for the U.S. Congress (18).

Equity Considerations

With regards to implementing new road pricing systems, equity considerations need to be addressed with the public at the earliest possible point (19). Equity considerations are generally raised in situations where a fee is imposed on the use of something that was generally regarded as "free." Mileage-based fees may be structured so that they act as a replacement for the fuel tax. If this is the case, then ideally travelers on average would pay the same amount for the same use of the roadway network. However, it is also possible that mileage-based fees could be implemented as a supplement to the fuel tax. If this is the case, then all travelers would pay more for the same use of the roadways. And while mileage fees may be structured as a replacement, the public is generally unaware of how much it pays at any given time in fuel taxes and might therefore view a different, and more transparent system, as an added fee, regardless of the individual fiscal impact. Therefore, it will be essential to address equity concerns with mileage-based fees no matter how they are structured.

Mileage-based fees are generally seen as fair. Focus group research conducted in Minnesota, Oregon, and Texas has shown that the concept of paying for road use in a

manner similar to common utility payment is accepted as a fairer alternative to the fuel tax. However, this acceptance of fairness does not necessarily translate into acceptance of mileage fees as a whole and does not mean that there are not major equity concerns.

Equity in general deals with the actual (and perceived) costs and benefits that accrue to different segments of society. (These segments are most often classified by income, location of residence, or minority status, but there are other social categorizations that might fill various definitions of equity.) Notions of equity differ from group to group depending on the nature of the project, but in general equity concerns raised by the general public fall into one of four categories (19):

- horizontal equity,
- vertical equity,
- the cost principle, and
- the benefit principle.

Horizontal equity refers to the notion that members of the same group should be treated equally. For example, a project that offers pricing incentives for low emissions vehicles or motorcycles could be attacked on horizontal income equity grounds because two drivers of the same income class will be charged different rates depending on the type of vehicle they drive. Deductions on federal income taxes for home ownership are often viewed as being horizontally inequitable because homeowners pay less in federal taxes than renters of the same income class.

Vertical equity is perhaps the most common equity consideration with regards to pricing applications and refers to the notion that members of different groups should be treated differently. Vertical equity with regards to income is evoked the most, and is generally raised, in situations where a potential project disproportionally affects lower income individuals. Under vertical equity, individuals of lower income status should pay less (as a percentage of total income) than individuals of higher income. Road pricing applications are frequently attacked on vertical equity grounds because the price for access does not vary based on income, meaning that lower income drivers pay a higher percentage of their income for road use than higher income drivers. The income tax is generally regarded as being vertically equitable because higher-income taxpayers are subjected to a higher federal tax rate.

Under the cost principle, those who generate and/or contribute to a social cost pay for doing so. In this sense, congestion pricing is very equitable because those that use a given facility during peak periods pay an added cost for the congestion. If viewed from a strictly environmental perspective, fuel taxes are equitable with regards to the cost principle in that the drivers of less fuel-efficient (and more polluting) vehicles pay an added cost for increased consumption of fuel.

The benefit principle refers to the notion that those who benefit from something should be the ones who bear the cost of it. Toll roads funded completely with toll revenues are equitable in this sense in that the drivers who benefit from the use of the facility pay for them.

It should be noted that various public policies may be rated equitable on some grounds and inequitable on others. And just because serious equity issues have been raised for a given project does not mean that the project may not move forward. As noted, equity is based on the dispersion of costs and benefits, and policies targeting this dispersion may alleviate many equity concerns. For example, one potential method of addressing equity concerns is to dedicate revenues toward projects or services that benefit those being affected by the proposed project. For example, revenues from the I-15 high occupancy toll (HOT) lanes project in San Diego, California, fund transit improvements within the corridor. Another potential strategy for reducing equity concerns is to simply offset any negative costs associated with the project by offering discounts to those who are the most adversely affected.

Given the many facets of equity, it is likely that no project can ever be deemed completely equitable. Consequently, policy makers need to articulate what the most critical criteria are for determining a given project's equity (19).

Implementing pricing on facilities that have been previously regarded as "free" will require extensive work on the part of policy makers in terms of public outreach. Even though mileage-based fees could be structured as a replacement fee and drivers would be no worse off than under the fuel tax, the mileage fees may be subject to the same requirements for public support as congestion management. This is due to the fact that the public has yet to make the connection between increasing fuel efficiencies and declining future fuel tax revenues and the added transparency a mileage-based fee would bring to the transportation financing system. Therefore, implementing mileage-based user fees will require strong advocates, which will only be created with the prospect of significant rewards (16). Dedicating revenue from the proposed pricing system to offset the negative effects of pricing will help garner support for the system, particularly if those revenues are dedicated to cities and local entities. These entities are generally small enough and well organized enough to generate consensus among their constituencies for the use of revenues, and from there strong advocates can be developed.

Rural areas have shown concern that fees based on actual miles traveled would disproportionately burden residents of remote rural areas that generally make long-distance trips. This would certainly be the case in a mileage-fee application where fee amounts do not vary based on levels of congestion or facility type. Furthermore, rural areas generally lack the quantity and quality of transit service that is found in larger metropolitan areas. Thus, structuring a mileage fee so that the rate varies based on whether travel is occurring in urban or rural areas might negate much of the concern

voiced by rural residents. And while such a policy might be construed as a diversion, dedicating revenues from such a system to the development of rural transit options could help address concerns about a lack of rural modal options relative to driving.

One of the central problems of addressing the equity concerns of rural residents with regards to mileage-based pricing is that there is a lack of data regarding the typical fuel economy of the rural auto fleet. The claim may be made that under a mileage-based fee system rural residents will be charged more because they tend to travel longer distances than urban residents. It should be noted, however, that those who travel greater distances will pay more than those who do not under the fuel tax system, and if they tend to drive less fuel-efficient vehicles than urban residents, then it is likely that they are paying even more per mile of travel. Without good information on how fuel economy varies between urban and rural areas, it is difficult to address these particular equity concerns.

There is the strong potential for equity concerns to be raised by the drivers of highly fuel-efficient and alternative fuel vehicles. There is a strong perception by many that the government has encouraged the purchase of these types of vehicles, either through the fuel tax itself or through the imposition of Corporate Average Fuel Economy (CAFE) standards. Many who purchase environmentally friendly vehicles therefore feel that they have made a “responsible” decision and are being punished by the imposition of a fee system that equalizes user costs across all vehicle classes.

These concerns can be partially mitigated during phase-in. For example, it may be desirable, for any number of reasons, to retain the fuel tax and transition to a true emissions tax. This would ensure that incentives for the purchase of fuel-efficient vehicles are continued. It may also be possible to structure fees where the drivers of environmentally friendly vehicles receive a discount on their mileage fees.

System Architecture

Once program goals and program policies have been articulated, development of the system architecture can commence. A mileage-based fee system, at the very least, must be capable of doing six things (19):

1. calculate miles driven,
2. access mileage data,
3. apply mileage charging rates,
4. provide a billing,
5. collect payment, and
6. enforce payment.

However, in developing the apparatus needed for system implementation, several issues will need to be considered. One of the most attractive aspects of a mileage-based

user fee system is the potential such systems offer in terms of providing transportation policy makers and other officials with accurate user data to aid in planning efforts. These same data may be used to provide the added value services that could prove pivotal in gaining public acceptance for such systems and inducing drivers to participate voluntarily. However, obtaining the necessary data for these applications comes at a cost in terms of driver privacy.

The fundamental tension between system needs and driver privacy stems from three issues related to system architecture (19):

1. the information collected on consumer activity,
2. the ability to audit, and
3. on-vehicle device capability.

Information Collected

Policy makers will need to decide to what extent a mileage-based fee system can collect information related to a driver's movement. A system may be designed to retain as little or as much information as desired, but the data collected will necessarily affect the ability to meet other policy and program goals.

For example, Oregon's Road User Charge Pilot Study collected very little information on traveler movement and was touted by ODOT as providing absolute privacy protection. By differentiating between mileage accrued in various zones, the Oregon system was able to ensure that mileage was properly allocated to the various zones within the study while providing the minimal information necessary to calculate tolls. Knowing the time of day that travel was occurring also allowed for a congestion pricing element to be incorporated. However, by collecting information on a zone basis, the Oregon model precludes the ability to levy facility-specific fees. The system tested by the Puget Sound Regional Council, however, collected very detailed trip data that allowed for facility-specific pricing.

Concerns about data collection will vary from user to user and between the motoring public and commercial vehicle drivers. Commercial vehicles are already subject to extensive state and federal oversight and are thus more amiable to surrendering a certain level of anonymity on the nation's roadways. Likewise, many users of modern electronic tollways surrender a substantial amount of privacy in exchange for fast and reliable travel times.

The proposed Austroads IAP program will collect more information than what would likely be necessary under a domestic mileage-based fee system. Collecting this level of information is possible because the system applies to freight vehicles and participation is voluntary. The IAP program will collect the following data from participating vehicles:

- vehicle identification,
- vehicle location,
- time,
- distance traveled,
- speed, and
- communications.

The system will use GPS technology and various digital roadside networks for the determination of time and location. The system will use dedicated short-range communications (DSRC) for communication with roadside equipment. Austroads is also considering ways to determine driver identification, trailer identification, and vehicle mass.

The German Toll Collect system, which assesses weight and distance charges on heavy trucks, collects data via GPS in order to determine when a vehicle enters or exits a tolled motorway and the distance traveled. The fee amount is calculated onboard and transmitted to a billing center via global system for mobile communications (GSM) technology where an invoice is generated and mailed on a periodic basis.

Ability to Audit

A certain level of data retention will be required if systems are to be auditable. System audit ability is a necessary attribute of mileage-based fee systems that will assure that they are properly calculating fees and charging drivers appropriately and evasion is minimized. How much data are required for a specific system to be audited will depend on the level of data the public is willing to allow a transportation agency to collect and the various policy goals of the system.

The ability to audit mileage charges will depend a great deal on legislative actions. In establishing mileage-based fee systems, policy makers will need to determine the desired time frame that is acceptable for data to be stored and the relevant data to be stored. Furthermore, policy makers will need to decide whether charge calculation is to occur inside or outside the vehicle. This will affect where data are aggregated for purposes of auditing. If all mileage data are to be collected and retained within the vehicle where charge calculation will then occur, then auditing will require the transportation agency to have physical access to the onboard unit being audited. However, if mileage data are exported outside the vehicle for charge calculation, then auditing can occur without needing to access the onboard unit.

System redundancy, especially in pricing applications that are technology intensive, is also an important consideration. The current fuel tax system does not use advanced technology for data collection and fee transmission, so unless there are problems with the actual fuel pump or a given service station’s point-of-sale (POS) software, there is rarely a loss of income due to technical failure. However, depending on the

configuration employed, there are numerous opportunities for mileage-based fee systems to be compromised and data lost.

Policy makers can help to alleviate these risks by establishing policies that promote redundancy and ensure that revenues are not lost to technology failure. For example, by structuring its proposed mileage-fee system as a replacement for the fuel tax and developing it in a POS-oriented configuration, the State of Oregon has ensured that even if onboard units (OBUs) fail to collect or transmit data, drivers will still be charged the fuel tax as a "default."

Device Capability

The amount and type of data collected, as well as data transmission methods, will affect the capabilities of the device employed within vehicles participating in a mileage-based user fee system. Systems that require fee assessment to occur onboard the vehicle will necessarily require more sophisticated equipment, thus raising the cost. A more detailed discussion of device capability issues is provided in the companion technical assessment published by the UTCM.

Program Structure

In its survey of international road user fee systems, researchers at UCLA found that there were two major implementation issues present: whether user participation is required or optional, and whether the rollout is immediate or phased in over time. The researchers found that most of the user fee programs surveyed were mandatory, particularly for "internal" users or those who live or work within the charging jurisdiction. However, in some instances—such as where the fee program amounted to merely monitoring of travel (such as the Australian Austroads IAP program), was applied to "external" users (such as programs that might affect trucks domiciled in other countries), or was in variabilized insurance pricing applications—participation was optional. Programs that are optional will generally not need to make an assessment as to whether rollout will be immediate or phased in. However, mandatory programs must make this determination. In general, international mileage-fee programs involving passenger vehicles have adopted a gradual phase-in strategy, such as requiring participation for new vehicles purchased. Most truck-tolling programs, on the other hand, have made participation mandatory, at least for internal users. The researchers noted that with programs that are gradually rolled out, a system for operating multiple charging systems in parallel throughout the transition phase will be required. The same could be said for the aforementioned truck-based systems, which must allow for alternate payment systems for non-participating vehicles such as the system employed by the German distance-based road charging system for trucks (14).

A third implementation issue will be discussed here: whether systems should be implemented so as to operate as stand-alones ("single jurisdiction") or whether they should cover multiple jurisdictions.

Voluntary or Mandatory Participation

The decision as to whether a mileage-based fee system is to be mandatory or voluntary will depend a great deal on the goals of the system. If the system is developed as a replacement for the fuel tax, such that the fuel tax is to be ultimately phased out and mileage fees are to bear the primary burden for funding transportation development, then participation will necessarily be mandatory at some point. The speed at which vehicles are brought into the system will then depend on the various incentives offered for participation as well as legislative mandates defining users of the system.

If a voluntary system is to be pursued, its success will depend in large part on the incentives offered to participate. These incentives may take many forms, but for the most part they will need to be of an added value to the user of the system. These incentives may take the form of services provided by the OBU for parking or pay-as-you-drive (PAYD) insurance. The cost of the onboard equipment will also be a major issue in a voluntary mileage-fee application. It is estimated that participation in the Austroads IAP program will cost around $30 to $50 per month for vehicles that are already equipped with the necessary telematics, while vehicles not equipped would absorb costs in the range of $110 to $190 per month. Development costs for the units tested by the Oregon Department of Transportation totaled $209 per unit, manufacturing costs were $338 per unit, and installation costs were $55 per unit.

A mileage-based fee system may be mandatory but not require all participants to install equipment in their vehicles. For example, a system could function so that drivers have the option of installing the equipment or could opt to have their odometers manually read at a given time, such as during vehicle inspection or registration. Financial incentives in the form of discounts could be offered to encourage equipment installation, and the ease of electronic billing relative to manual readings may in and of itself induce many to install the necessary equipment. Even if discounts are not offered for those with the necessary equipment, many may find monthly or weekly billings to be preferable to one large payment that is due on an annual basis.

Phase In: Immediate or over Time?

Many factors will determine the time required to implement a mileage-based fee system, but an overriding factor is likely to be cost. A quick implementation time frame and a mandatory system will most likely be the most expensive because it would require all vehicles to be retrofitted with the appropriate technology. From a technological standpoint, it would be extremely difficult to develop a mileage-fee system that could be retrofitted to all vehicles within a given taxing jurisdiction. The State of Oregon found that many of the vehicles that volunteered for its pilot program had to ultimately be excluded. The lack of standardized ports and standardized power systems meant that the technology developed for the pilot could not be installed in all models and makes. Furthermore, there were problems with the OBUs draining batteries on some of the vehicles where installation had proved successful (13). Coupled with the aforementioned public resistance a mandatory program would trigger, an immediately

phased-in, mandatory mileage-based fee program seems to be the least viable option. However, this would complicate enforcement of the fee because a retrofitted device would be easier to sabotage than a device that is fully incorporated in the vehicle. (This of course assumes that the mileage-fee system is technology dependent. As noted above, there is the possibility of implementing a tiered system that is not reliant on the installation of in-vehicle equipment.)

Implementing a mileage-based fee system and retrofitting commercial vehicles may be easier than developing a system and retrofitting personal vehicles. This is due in large part to the smaller number of commercial vehicles on the roadway system relative to personal vehicles and the commercial trucking industry's familiarity with travel monitoring on the part of the government, which would reduce resistance.

A phased-in implementation schedule could take many forms. For example, the system could be targeted only toward those vehicles that come pre-equipped with the necessary technology and vehicles that fall outside of the traditional fuel tax collection framework such as electric vehicles. This would allow the number of users participating in the mileage-fee system to increase as a percentage of total road users as older cars are removed from the vehicular fleet.

A slow phase-in might incorporate some level of voluntary participation. However, there are currently no participatory mileage-fee systems in operation. The Australian Austroads program, for example, is voluntary, but no fee is actually assessed.

An immediately phased-in program is perhaps the most challenging, and a mandatory system does not necessarily imply that all vehicles within a certain pricing jurisdiction are subject to the mileage fee. For example, the fee might be targeted only toward vehicles that fall outside of the traditional fuel tax collection framework, such as fuel cell vehicles and other types of vehicles that do not need to be refueled at service stations where the fuel tax is traditionally paid.

Single Jurisdiction versus Multiple Jurisdiction Systems

A multiple jurisdictional system may be composed of peer-level jurisdictions (such as multiple adjacent counties and/or states) or hierarchically structured. These decisions will be based mainly on the direction set by the federal government as well as to the extent that states are willing to coordinate efforts in the event that no federal direction is provided. Ensuring that in-vehicle equipment is capable of recording data for use by single and multiple jurisdictions is not a major issue. Rather, ensuring that new institutional capabilities exist for collecting the revenues under these systems and distributing them may be problematic (14).

In its survey of international mileage-fee systems, the UCLA Institute of Transportation Studies noted that about two-thirds of the projects identified were designed to be implemented within single jurisdictions (14). The researchers noted, however, that

there is a high probability that these programs will eventually evolve to incorporate multiple jurisdictions. The researchers went on to note that adapting the relevant in-vehicle technologies to function in multiple jurisdictions would be trivial, but developing new institutional capabilities for the collection and distribution of revenues would be required.

The “Balkanization” of the national highway system through the development of local and state tolled facilities, with each entity pursuing its distinct pricing and policy approaches, poses a significant threat to overall system efficiency and consistency (8). Stronger federal guidance has been suggested as a means of deterring this potential development, and the same approach should perhaps be considered with regards to the development of mileage-based fee mechanisms. For example, the federal government could ensure that state and local pricing decisions do not conflict with interstate commerce laws and objectives, which would provide for common ground in developing mileage-based fee systems in states that are adjacent to one another.

A system that allows multiple jurisdictions to levy mileage fees may be particularly problematic for the trucking industry. Without coordinated, centralized billing, a single carrier could potentially be faced with maintaining accounts for numerous trucks for numerous jurisdictions. The variety of pricing options that could be applied to these types of fees, such as pricing by time of day, level congestion, or vehicle weight, would further complicate the accounting process for carriers and would make it difficult, if not impossible, to accurately calculate the cost of a particular trip (13).

Switzerland, Austria, and Germany have all developed distance-based truck tolling programs, but none of the systems are interoperable. This has led the European Commission to launch an Interoperability Directive to promote unified standards for GSM-GPS technology. Therefore, it is expected that future distance-based charging systems will perform with a higher degree of conformity and uniformity (14).

If a mileage-based user fee system is to be implemented on a national level, with the eventual goal of capturing all miles traveled by all users of the national roadway network, then added consideration needs to be given to matters of system security. The current fuel tax system is a relatively simple and decentralized mechanism for collecting road user revenues, making it nearly impossible to attack and cripple. However, a national, centralized, and technology-dependent mileage-fee system would become a crucial component of the nation’s infrastructure system and would thus be a desirable target for coordinated attacks by various elements of society. Therefore, consideration should be given to establishing preferred policies with regards to administration and to the fact that security measures will need to be more robust with increased centralization (13).

Public and Private Roles

Many have called for the expansion of the private sector in delivering transportation-related services. The development of the appropriate technology for implementing and administering a mileage-based fee system is likely beyond the capacity of most public-sector entities. The Puget Sound Regional Council determined that it was not capable of developing the software and hardware needed for its Traffic Choices study. It turned to the private sector and selected Siemens, which supplied devices similar to those employed in the German Heavy Vehicle Tolling Program (13). Therefore, there will be a role for the private sector to play in the process. However, should the private sector's role in a mileage-based fee transition be limited only to technology development?

In terms of system *oversight* responsibilities, most existing mileage-based fee systems use public-based mechanisms, while roughly half use private entities for *operations* (13). Multiple jurisdiction systems are more likely to use private contractors for administrative duties, while single jurisdiction systems are more likely to use public entities for these functions. Most existing mileage-based fee systems have tapped extensively into the private sector for *system development*, with the majority of these systems being contracted to sole providers (14).

It is widely accepted that the long-term success of a mileage-based fee system will depend a great deal on the integration of necessary technology into new cars. Retrofitting older vehicles with the proper equipment has been shown to be a very costly prospect, implying that it will be necessary for auto manufacturers, at some point in the future, to ensure that new vehicles come pre-equipped with the appropriate technology. The NSTIFC has recommended that the federal government establish mileage-fee technology standards and require auto manufacturers to install standardized technology in new vehicles to accommodate a 2020 comprehensive mileage-fee implementation deadline (8). The commission notes that these systems should accommodate a full range of potential charge systems and allow for state, local, and private toll roads to "piggyback" on the national system.

The Austroads IAP program offers one potential model for private deployment of technologies that can be used in a mileage-based fee system. The proposed program, for which a feasibility study was recently completed, is envisioned as a means of better managing existing road and transportation policy compliance and enforcement for commercial vehicles in Australia and New Zealand. Under the proposal, governmental agencies would be responsible for setting freight policies and establishing technical specifications for various onboard equipment. Private entities would then develop technical applications, which would be certified by the appropriate governmental agencies, and offer their services to freight transport operators on a fee-for-service basis. This allows for the development of added value applications such as fleet monitoring and routing that can compete in a market setting. It was estimated that in

order to entice the desired minimum of three IAP private-sector service providers, at least 2,500 vehicles would have to opt into the system over a three-year period (14).

The German Toll Collect System is a public-private partnership with overall authority for policy and pricing residing with the Ministry of Transport. Toll Collect is responsible for collecting user charges and transferring them to the Ministry of Transport and receives reimbursement for its services.

Administration

The motor fuels tax is generally collected at the terminal level, or wholesale level, and is initially paid by a small number of payers (comprised mostly of fuel distributors) relative to the number of drivers on the road. Each successive purchaser of fuel reimburses the previous holder of the fuel, until eventually individual drivers are reimbursing fuel retailers. The Internal Revenue Service, which collects federal fuel tax revenues, and various state fuel tax collection agencies are not required to maintain extensive collections, accounting, and administration systems. However, a move to a mileage-based user fee system, especially one implemented at the national level, would require the development of an administrative apparatus capable of collecting and processing payments from millions of drivers. This could prove to be a particularly daunting task.

It is estimated that the cost to administer and enforce state and federal motor fuels taxes ranges from 0.2 percent to 1 percent of gross receipts. This amount can vary for state fuel taxes. In Texas, one cent of every dollar in fuel taxes collected is retained by the State Comptroller of Public Accounts for administration and enforcement efforts.

The fuel tax is collected in a POS context. When drivers make a fuel purchase, they are also charged for fuel taxes, which are included in the price of the gasoline. Consequently, evasion of the fuel tax at the retail level is generally very low, if not nonexistent. Furthermore, there is little need for enforcement protocols because drivers who may wish to refuse to pay the tax will find it almost impossible to do so without also fueling their vehicle.

Given the efficiency of the fuel tax in terms of collections and enforcement, it will be extremely challenging to design a mileage-based alternative that functions with the same ease. In addressing this challenge, policy makers should focus on four aspects of fee payment:

- the method by which fees are assessed,
- the method by which fees are collected,
- data aggregation
- the burden of responsibility.

Assessment Methods

There are many potential methods for assessing a mileage-based user fee, each with its own advantages and drawbacks.

The simplest and least technology-dependent option would be manual odometer readings. The easiest way to accomplish this type of mileage reading would most likely be to require readings at the time a vehicle is registered or inspected.

A manual reading of the odometer would likely require several steps. It would first need to be checked for any indications of tampering, and in the case of older vehicles (that do not have their speedometer and odometer electrically linked to the engine computer) a seal system might need to be employed to ensure that the odometer cable has not been tampered with. The check might also require a visual inspection of tires because tires that are not factory size might result in inaccurate odometer readings (12).

While this option would be the cheapest in terms of needing to develop new technologies, it does have costs in terms of the labor that would be required. Annual vehicle inspections require a physical inspection of the automobile and may be less costly than implementing an odometer-reading program that is based on vehicle registrations, which do not generally entail a physical inspection of the vehicle. It has been estimated that manual odometer readings would take five to 10 minutes (20).

One of the biggest drawbacks of odometer reading for the assessment of mileage fees is that it would be impossible to allocate fees based on travel in other taxing jurisdictions. Travelers would pay for all mileage accrued on their vehicle to the taxing jurisdiction regardless of any mileage actually traveled there.

Another drawback of this approach is that it would likely only be possible to take readings once a year per vehicle. While this may not be a drawback in terms of revenue collection, since vehicle registrations and inspections occur year-round, it may be less acceptable to the motoring public due to the fact that one large bill would need to be paid rather than ongoing payment of fees in smaller increments.

Collection Methods

It is much easier to provide drivers with a credit for fuel taxes in a POS configuration. Central billing may entail substantial mailing and collections cost, depending on payment options. If fees are to be collected outside of a POS context, then cost could become substantial in terms of mailing out invoices and receiving and processing payments. This cost, however, can be mitigate by incorporating a pre-paid element to the process and allowing customers to establish electronic accounts that can be replenished by use of a credit card or other electronic means. Email-based billing may also be an option that can be considered for reduced cost. If payment by mail is to occur, however, collection costs could be substantial. Research in Northeast Texas

showed that there could be significant numbers of people who refuse to pay bills received through the mail, especially if there is no built-in enforcement mechanism.

Paying at the pump, however, has drawbacks depending on the future market penetration of alternative fuel vehicles. Plug-in vehicle technology, for example, could possibly result in a vehicle class that falls completely outside of both the fuel tax and mileage-fee collection network.

The frequency of payment is an additional issue that must be addressed. Fee systems may be designed, in the case of the Oregon pilot, so that users pay their fees in a POS context. Other systems, such as those tested by the Puget Sound Regional Council and the University of Iowa, would charge drivers on a periodic basis. Periodic and POS (or other "infrequent" payment options such as payment via roadside equipment) transactions both have their advantages and drawbacks. Frequent payment systems may result in lower billings, which could increase public acceptance, but may be difficult to enforce if users are given the option of paying via mail (19). POS systems would reduce enforcement costs in terms of collections but would likely cost more to implement because service stations or other fee collection areas would have to be outfitted with the appropriate equipment.

Administrative costs associated with the collection of the fuel tax are quite low, often in the range of 1 percent of gross revenues. However, a mileage-based fee system is unlikely to be administered at such a low cost. For example, the Swiss truck toll program, one of the most cost-effective systems analyzed prior to Oregon's Road User Fee Study, operated at around 8 percent of gross revenue in 2004 (14). Fee increases are expected to lower this percentage to around 5 or 6 percent, but this cost would still be substantial relative to the fuel tax here in the United States.

A mileage-based user fee that is administered at the pump, is not mandatory for all drivers, and must therefore credit participant drivers for fuel taxes paid would impose cost on the private sector due to the need to more closely monitor fuel entering the state for retail sale. Under the current, distributor-level fuel tax collection framework, it is not necessary to monitor the volume of taxable fuel entering a state for consumption because that fuel has generally been taxed at a very high level in the distribution chain, and subsequent carriers of that fuel have an incentive to recoup the taxes they have paid. Introducing a tax collected at the retail outlet would therefore require additional reporting procedures on the part of private carriers to reduce the potential for evasion.

Departments of motor vehicles (DMVs) may be able to assist in the enforcement of mileage-based user fees not collected in a POS context. For example, in Austin, Texas, a significant portion of tolls are collected through the reading of license plates by gantry-mounted cameras. The area DMV has provided assistance to the area's toll operators by matching these images to registered vehicles in the area for the facilitation of fee payment (13).

The German Toll Collect System for heavy trucks uses a dual payment system: one for infrequent users and one for frequent users. Frequent users of the system use an onboard unit that collects mileage information, assesses the appropriate fees, and transmits the information to a billing system. These frequent users receive a periodic invoice. Infrequent users, who do not use the onboard equipment, must prepay for each trip at various roadside kiosks or over the Internet (21).

For legal reasons, Switzerland cannot make the installation of onboard equipment mandatory for foreign vehicles; thus the Swiss HVF system uses a tri-tiered billing system. Vehicles equipped with the appropriate equipment use a payment system that calculates fees based on the maximum laden weight of the vehicle and the emissions class (which are stored on the OBU) and reads mileage through the odometer. Roadside microwave transmitters located at major boarding crossings signal the OBU when the vehicle enters and exits the country, and mileage counting commences. GPS technology acts as a backup for registering border crossings that occur in areas not covered by roadside equipment. Data from the OBU are forwarded on a monthly basis to federal authorities, who generate an invoice. Vehicles not equipped with the appropriate equipment must register each trip and report the vehicle's weight, emissions class, and route, and the appropriate fee must be paid in full before the vehicle exits the country. Fee calculation follows the same process as for equipped vehicles, but the process is more cumbersome and thus offers an incentive to obtain the appropriate equipment, which is free for all vehicles regardless of where they are domiciled (14).

It appears that the best option may be a multi-tiered payment system that allows numerous payment options. While this may increase administrative costs, it would have the benefit of allowing drivers to select the payment option that best suits them, which would increase public acceptability and would cover all vehicle types regardless of their means of propulsion.

Data Aggregation

To carry out many of the value-added and other policy-oriented goals that a mileage-based fee system might encompass, it will be necessary for driver data to be aggregated at some point. This may occur at a central billing office, regional transportation offices, or even on the vehicular onboard unit.

It is possible to develop OBUs that are capable of aggregating mileage information, assessing the pertinent fees, and then only transmitting fee information for billing purposes. The European Union, for example, has prohibited any location information from being transmitted outside of vehicles participating in distance-based charging programs. OBUs are therefore required to perform all charge computation onboard using a stored rate schedule that must be updated continuously. Charge information can then be calculated and forwarded to a billing agency while location detail is stored on the unit for verification and dispute resolution purposes.

Many local entities may find value in aggregating mileage information at the local level. For example, the State of California requires drivers to report their yearly mileage at the time they renew their vehicle registrations. While no charge is actually levied on this mileage, the state hopes that the information gathered will help to guide environmental policy making with regards to congestion reduction and air quality attainment initiatives. Mileage information aggregated at the municipal, or even the state, level could therefore greatly benefit these types of efforts if privacy concerns can be addressed.

Burden of Responsibility

Many of the administrative issues discussed above can be classified in terms of where the burden of responsibility for payment lies. For example, if a mileage-based fee system were to be implemented with payment occurring in a POS context, then the burden of compliance is primarily on the collecting entity. Each individual driver is responsible for paying fees at the time fuel is purchased (or at whatever time a transaction occurs wherein the mileage fee is paid) and is not responsible for maintaining accounts or mailing in payments. It is this simplicity for the driver that drove the Oregon Department of Transportation's decision to use a POS-type transaction system (13).

However, reducing the burden of responsibility for individual drivers may increase administrative costs. Placing the onus for payment on the driver means that increased enforcement activities will be warranted. Policy makers will need to determine the appropriate level of responsibility for payer and payee in a mileage-based fee system, keeping in mind that there are likely to be significant costs for each approach.

Possible Implementation Strategies

Five overarching theme have developed with regards to a potential transition to mileage-based user fees as the primary mechanism for financing transportation programs.

- The federal government should provide policies, frameworks, enabling legislation, and financial support, and the states should test the concept with more, diverse, larger, and even multi-state pilot projects.
- An empowered consortium or national commission should be convened to develop a road map for implementation.
- There is a general desire for the federal government to lead but a recognition that the states will move faster toward a transition to address their own needs.
- There were opposing viewpoints on the time frame and pace of transition. Several suggested an interim DMV-based system deployed in the near term, while others proposed an incremental transition over a longer period.

- Listening to the public was encouraged in early stages to define the "value proposition" and to help articulate benefits.

International Implementation Strategies

For its proposed IAP program, Austroads has recommended a two-stage implementation approach. Stage 1 would involve developing system applications that can be delivered quickly with available technology, while stage 2, the development of wider-ranging applications, would be contingent on the success of the initial program.

Stage 1 of the IAP program will be targeted at three general nature and three niche programs. The general purpose applications will apply to (14):

- Dangerous goods vehicles—IAP will focus on ensuring route compliance, freight consignment identification, gross speed violation, and driver identification (for security purposes) for vehicles classified as shipping dangerous goods.
- Specialized rigid vehicles—These types of vehicles include cranes, controlled access buses, agricultural equipment, and other types of specific-use vehicles. The IPA will focus predominately on ensuring route compliance for these types of vehicles.
- Low loaders—The IAP will focus on enforcing route compliance and gross speed violations for these types of vehicles.

The niche-level application will apply to (14):

- Mass concession scheme—This aspect of the program will be oriented toward vehicles that operate "over mass" on approved networks and will focus on route compliance, mass management accreditation, and gross speed violation.
- Higher mass limits—Like the mass concession scheme, this aspect will apply to higher mass vehicles that operate on the expanded network and will focus on route compliance, mass management accreditation, and gross speed violation.
- Performance-based standards and innovative vehicles—Focusing on route compliance, mass management accreditation, and gross speed violation, this aspect of the program will apply to tailored vehicles operating on approved routes and networks.

The Australian Transport Council endorsed the results of the feasibility study and has recommended implementation. A steering committee is currently developing and maintaining the implementation schedule.

The German Toll Collect system grew out of the Euro-Vignette system, a European program that applied to vehicles with a gross weight ranging between 12 and 40 tons. Countries within the European Union that were not already using a general charging system agreed to participate in the program in 1995. The program was codified with

European Union Directive 62/1999, which allowed for distance-based truck tolls on European motorways for vehicles over 12 tons. Based on this directive, Germany passed the German Law for Motorway Charging of HGV, which includes charges that vary based on distance and emissions but not time of day (14).

Initial and Intermediate Steps

One of the first steps that will need to be taken if mileage-based fees are to be pursued by a transportation authority as a revenue-generating mechanism will be to establish principles that will eventually be used to articulate policy. For example, prior to developing policies for its road user fee program, the State of Oregon formed the Road User Fee Task Force, which, in addition to settling on mileage-based fees as the preferred mechanism to pursue from a research perspective, also articulated two overarching principles for the development of pricing policies: all motorists are to be covered under the system, and the system should not charge for mileage driven out of state. While there were other principles articulated by the task force, such as protecting driver privacy, these two were the primary drivers of policy development. Once these principles were set, it took about a year and a half to fully develop the system that was to be tested (13).

A 2003 report by the Texas A&M University discussed a possible VMT-based fee implementation strategy that could be carried out over the course of 20 years or more. The report noted that the effort would require extensive state and federal coordination and stated that full implementation could occur through the following process (12):

1. create a task force,
2. conduct small-scale pilot tests,
3. devise and propose legislation,
4. perform physical/institutional infrastructure installation,
5. conduct start-up with a concurrent VMT fee and fuel tax, and
6. perform full implementation.

The implementation of pay-as-you-drive insurance is seen by many as an initial step toward full implementation of a national mileage-based user fee system (13). PAYD insurance would have many of the same effects as a broad-based mileage-fee system, in that it would make vehicle costs more transparent on a trip-by-trip basis and would discourage drivers from traveling during periods of high risk. The Brookings Institute estimated that a PAYD insurance program could potentially reduce national VMT by 8 percent, could reduce total U.S. carbon dioxide emissions by 2 percent, and save U.S. households around $270 per year.

Oregon Implementation Plan

After the successful conclusion of its Road User Fee Pilot Study, the Oregon Department of Transportation began developing plans for the rollout of a statewide mileage-based

user fee system. To date this is the only implementation plan developed for domestic implementation of such a fee system.

ODOT's near-term implementation plan involves a system built largely off the system tested in its pilot study. The system will use GPS satellite technology to determine vehicle location. Onboard units will be equipped with GIS software loaded with coordinates that delineate the various pricing zones that will comprise the statewide fee system. Implementing a pricing system that allocates fees based on zones, and not based on specific facilities, reduces traffic diversion from major freeways to arterials and helps to protect driver privacy by removing the ability to track specific trips and route choices.

ODOT plans to use the pay-at-the-pump model developed in the pilot test. Admittedly, the system will not capture electric vehicles or vehicles that do not run on fossil fuels. However, ODOT believes that the system can evolve to capture these vehicles at some point in the future when these classes of vehicles begin to comprise a significant segment of the statewide auto fleet. This will be accomplished by structuring the payment system so as to allow for fees to be paid outside of a POS context. In other words, the system would allow the drivers of fossil fuel–driven vehicles to pay when they make fuel purchases, while alternate fuel vehicles would pay by some other means, such as online or through the mail. This means that in addition to developing a system architecture that allows OBUs to communicate with fuel pump equipment, a parallel system will also be developed that allows for the transmission of mileage fees through cellular channels. ODOT has stated that there should be no limits as to "how" data are transmitted, only that there be limits on "what" is transmitted.

ODOT's system would allow for a number of different rate structures. Depending on the preferences of policy makers, fees can be adjusted to take into account fuel efficiency (thus preserving incentives to purchase more fuel-efficient vehicles), vehicle weight, or any other number of factors. For example, a multiplier could be applied to the assessed mileage fee based on vehicular fuel efficiency, which would increase the mileage rate for less fuel-efficient vehicles while maintaining a lower fee for high fuel efficiency vehicles (Figure 1). Flexibility in rate structure allows transportation policy makers to adjust rates in response to various equity concerns raised by various stakeholders. It also allows the implementation of other pricing options such as congestion pricing. To facilitate this flexible pricing system, ODOT is proposing that its near-term implementation model be interconnected with various statewide vehicle databases such as those maintained by departments of motor vehicles.

MPG	Multiplier
42+	1.0
34	1.2
26	1.5
22	2.0
18	2.5
15	3.0
10	4.0
6	6.0

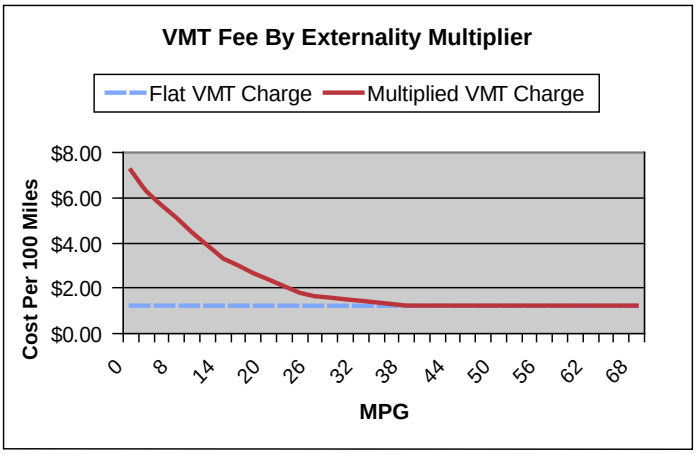

Figure 1: Potential fee structure with applied externality multiplier

Source: Oregon Department of Transportation

In essence, the ODOT model is an "open platform," meaning that it is flexible and can be adapted in terms of data generation, data transfer, invoicing, and payment (19).

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APPENDIX A: INSTITUTIONAL ASSESSMENT TEAM MEETING

December 22, 2008

PARTICIPANTS:
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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 is 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 though 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 publically, 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.

APPENDIX B: MILEAGE-BASED USER FEES: THE PATH FORWARD

Symposium on Mileage-Based User Fees, April 14-15, 2009
Report on Closing Discussion Session

Background

The conventional wisdom that fuel taxes can provide adequate long-term funding for transportation programs is being questioned. Various market pressures and governmental regulations are working to drive up average vehicle fuel efficiencies, meaning that the average driver will be paying less fuel tax in the future to use the nation's surface transportation system. Furthermore, the federal fuel tax has remained static since 1993, and many state legislatures have shown a reluctance to increase their respective state's fuel tax rates. As a result, the fuel tax has lost significant purchasing power due to inflation, a trend which has been exacerbated by steep increases in the cost of building and maintaining roadways.

These concerns have not gone unnoticed. In 2006 the Transportation Research Board (TRB) formed the Committee for the Study of the Long Term Viability of Fuel Taxes for Transportation Finance. Among the committee's numerous recommendations was a proposal to conduct rigorous evaluations of technical options for use-based fee systems as promising replacements for the fuel tax. The 2008 final report of the National Surface Transportation Policy and Revenue Study Commission echoed this sentiment by recommending that the next surface transportation authorization act require major national studies to develop mechanisms and strategies for transitioning to usage-based alternatives to the fuel tax for funding surface transportation programs. Furthermore, the recently released final report of the National Surface Transportation Infrastructure Financing Commission concludes that use-based fee systems, and specifically systems based on miles driven, are the most viable mechanisms for funding long-term surface transportation needs.

Purpose

The Texas Transportation Institute and the University of Minnesota's Hubert H. Humphrey Institute and Center for Transportation Studies hosted the first national Symposium on Mileage-Based User Fees in Austin, Texas, April 14-15, 2009. The vision of the conference was twofold: to advance the discussion on mileage-based fees as a potential replacement for the fuel tax, and to engage participants in a facilitated discussion to articulate a possible path forward.

Eighty transportation professionals from 12 states and over 50 organizations gathered for a day and a half to hear presentations from experts on the state-of-the-practice in mileage-based fees, also called vehicle-miles traveled fees. Participants represented all levels of government, academic institutions, trade associations, advocacy groups, and the private sector. Panelists from a variety of organizations spoke on a number of issues

surrounding this topic, including institutional issues, public acceptance, technology options, and perspectives of stakeholders and local officials. The symposium program can be found at the web site http://utcm.tamu.edu/mbuf.

At the opening of the conference, participants were asked to consider three questions during the course of the symposium:

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

The closing activity of the conference featured an interactive discussion session facilitated by Robert Johns of the Center for Transportation Studies and Katherine Turnbull of TTI. Using an innovative "conversation circle" format, each question above was posed by a moderator, and participants were invited to join the circle and offer their responses to the individual questions.

The purpose of this document is to provide a summary of the general themes based on responses to each of the three questions and a detailed synopsis of the individual responses.

Summary of Responses: General Themes

In general, there was not clear consensus among the group on responses to the three questions, but there were a number of general themes that emerged from the discussion. A summary of the themes is presented below, with a detailed synopsis of all responses provided in the following section.

Question 1: What are the greatest challenges or barriers to transitioning from the fuel tax to a per-mile fee?

The greatest challenges or barriers can be categorized into three groups:

1. Public acceptance challenges
   - *Privacy*—This refers to public concerns over what data are collected at the vehicle and what is transmitted to assess a mileage fee. System design must ultimately address privacy concerns.
   - *Need*—The benefits of a mileage-based user fee system must be stated. The new system must add value over the current system, and public policy and education need to articulate those benefits to the public.
   - *Trust*—Public trust in the transportation investment and the transportation planning processes is low. The current revenue allocation process does not inspire public trust, and that does not bode well for garnering support for a new,

costly fee collection system. General government distrust is also a factor in technology design.

2. Political leadership challenges
   - Political leadership challenges were articulated by the participants as "lack of political will" and "lack of national direction." Most participants believe action at the national level is important because interstate commerce and travel will be impacted. The lack of clear national vision and clear system objectives was cited as a significant impediment.
   - The absence of an organized coalition with an agenda and plan for implementation was expressed as a barrier.
   - Education of state and local officials, especially during initial demonstration of the concept, was highlighted as more urgent than general public education.
   - There was discussion about the lack of policy definition of mileage-based fees as a replacement for the fuel tax at current levels versus a means for expanding funding levels. Revenue neutrality likely has the best chance of gaining public support, but the true need is expansion of the funding base.

3. Fuel-tax-to-mileage-fee transition challenges and barriers:
   - *Standards*—Technology standards are necessary to guide system development and ensure interoperability as opposed to a collection of independent systems. Federal leadership will be particularly important in this regard because the federal government is best positioned to ensure that a system can be developed with the broadest applicability to state and local agencies.
   - *Resources*—There is concern that costs are high and moving forward will require significant federal support for pilot projects at the state level and for ultimate implementation nationally.

Not all participants agreed with the general themes highlighted in the three categories above. Two individuals expressed concerns about moving too quickly toward a "quick fix," with poor decisions resulting. On the other hand, one felt that "experts" are the barrier because of a greater interest in studying rather than implementing.

Another participant requested a wholesale re-examination of the question: maybe there is no transition to a per-mile fee and the gas tax remains in place because it has high public acceptance. This individual suggested that other fees (such as vehicle registration) be based on actual use of the system.

Question 2: What would the transition look like and who would lead?

Five overarching themes emerged on the question regarding transition and leadership:

- The federal government should provide policies, frameworks, enabling legislation, and financial support, and the states should test the concept with more, diverse, larger, and even multi-state pilot projects.
- An empowered consortium or national commission should be convened to develop a road map for implementation.
- There was a general expression of a desire for the federal government to lead but recognition that the states will move faster toward a transition to address their own needs.
- There were opposing viewpoints on the time frame and pace of transition. Several suggested an interim DMV-based system deployed in the near term, while others proposed an incremental transition over a longer period.
- Listening to the public was encouraged in early stages to define the "value proposition" and to help articulate benefits.

Question 3: What additional research, testing, and demonstrations are needed?

The responses to this question represent a mix of technological and social science research needs:

- Conduct pilot projects to test multiple technology platforms with possibilities for bundled or value-added services.
- Perform research to identify objectives that can be achieved by mileage-based fees.
- Identify a framework for implementation and estimated costs.
- Study equity issues, comparing the existing system with a mileage-based system, and research fairness concerns, such as urban versus rural interests.
- Research public acceptance issues to gain an understanding of resistance to the concept and identify what is necessary to build trust.

Conversation Circle Participants

Moderators: Robert Johns, Center for Transportation Studies, University of Minnesota
Katherine Turnbull, Texas Transportation Institute, The Texas A&M University System

Discussants: Trey Baker, Texas Transportation Institute, The Texas A&M University System
Ken Buckeye, Minnesota Department of Transportation
John Cloutier, North East Texas Regional Mobility Authority
John Collura, University of Massachusetts
Jerry Dike, DMV consultant, Jerry Dike and Associates
Ron Fagan, Central Texas Regional Mobility Authority
Deepak Gopalakrishna, Batelle Memorial Institute

Bern Grush, Skymeter Corporation
John Habermann, Indiana Local Technical Assistance Program, Purdue University
Matthew Kitchen, Puget Sound Regional Council
Jon Kuhl, University of Iowa
Jim March, Federal Highway Administration
Adrian Moore, Reason Foundation
Richard Mudge, Delcan Corporation
Lee Munnich, Hubert Humphrey Institute of Public Affairs, University of Minnesota
Mark Muriello, Port Authority of New York and New Jersey
Greg Oliver, Delaware Department of Transportation
Carla Perez, Office of Governor Bill Ritter, Jr., State of Colorado
Michael Replogle, Environmental Defense Fund
Darrin Roth, American Trucking Associations
Shelly Row, U.S. Department of Transportation Joint Program Office
Duncan Stewart, Texas Department of Transportation
David Ungemah, Texas Transportation Institute, The Texas A&M University System
Jason Van Havel, Nevada Department of Transportation
Jim Whitty, Oregon Department of Transportation

Recorders: Tina Geiselbrecht, Texas Transportation Institute, The Texas A&M University System
Joan Hudson, Texas Transportation Institute, The Texas A&M University System

Detailed Responses by Participants

The following are individual responses by symposium attendees to the questions being discussed and should not be construed to represent a consensus view of all those in attendance.

Question 1: What are the greatest challenges or barriers to transitioning from the fuel tax to a per-mile fee?

- The big challenge is effectively communicating with and educating elected officials. Elected officials need to have answers first before the general public. This is more immediate than the issue of engaging the public. State and local legislators need answers immediately.

- Political will is the biggest challenge. Several groups have already endorsed the concept, but Congress has to accept this, put it into the legislation, and set a

time-specific framework. If there is the political will, the experts and FHWA can make it happen. FHWA's role would be to ensure cooperation of the states. Talk with various states to see how state VMT charging systems would be compatible with federal system.

- "Experts" are the barriers. Stop doing pilots and just move forward. Mileage-based fees cannot be done from a national level. The presumed need to focus on a national system is another barrier. This should all begin at the state level with trucks, and the focus should ultimately be on replacing the gas tax. The barriers are the attitudes and assumptions of those who want to do something but will study it too much.

- The greatest challenge is to state clearly the value of the program. Public policy and communication need to clearly define the value proposition to the public. The toll industry does this well on tolled facilities.

- The biggest challenge is having the necessary resources for implementation. It will be difficult for states to do this individually. A national system should support state development.

- Privacy, standards, and trust are the challenges. Legislation is essential to establish privacy controls. Standards need to be developed in the United States. Trust needs to be built in the technology. There is a need for bigger pilots to demonstrate how this can work.

- The barrier is the people who want a quick fix. We cannot mangle VMT fees to meet the unrealistic wants of politicians. People are unwilling to see more investment at the national level, but rather the investment needs to be at the state and local levels. The federal government must recognize that it should have a more limited role and concentrate only on federal-level projects.

- The challenge will be expansion of the financing base into the future. This implies that people will be paying more for transportation, but what if people do not want to spend more of their money on transportation? The value proposition offered to the public needs to be not only in a transportation context but others. This value proposition will have to be articulated in terms of quality of life and in relation to other priorities.

- The barrier is moving too quickly. In our rush for action, we will make poor choices, especially in the area of technology. This is not trivial. We need to study the options more. We should look at several design options through several pilots. Technology is not groundbreaking, but the technology issues are key to successful implementation.

- The biggest barrier is the need for specific guidelines. If a VMT fee system is not mandated, you will get 50 different standards. VMT fees need to remain a revenue-raising approach rather than a revenue redistribution approach.

- Political will. We need to be legislatively empowered to do this type of program. Unfortunately, we will probably need a crisis to reach that point. It may take more bridges falling down because Congress will not have the political will to make changes until we have a crisis.

- Federal leadership. Since interstate commerce and travel will be impacted, federal leadership is essential. We cannot have different states with different technologies and expect to have an efficient system.

- Cost is the barrier. Funding is needed at all levels and should be provided to implement VMT fees using the state DMV systems that are in place.

- The challenge is re-examining the question to see if it is the right one. Is the motor fuel tax the right tax to replace? Registration fees are a better replacement because they have no link to use. Retain the fuel tax and change registration fees to a use-based system.

- The biggest barrier is convincing the public that we need a new system when we have not tried the "easy" solutions: raising the gas tax, indexing the gas tax, reducing diversions, and eliminating earmarks. These may be politically difficult, but in the public's eyes these are the logical solutions.

- The barrier is the transportation investment process. We need to recognize that we cannot rush to a solution when there is not a clear understanding of what the problem is. It is not just funding but decision making for transportation investment. As an industry, we need to own up to the imperfections of formulas, distributions, and earmarks.

- The challenge is the lack of understanding that there is a need for increased funding. People need to believe that the current money is being spent well to accept that there is a need to increase it. Before we can talk about increasing funding, the public will need to understand the unmet needs and the funding mechanism to address the problem.

- If you want to make a fundamental change in policy, there will have to be an organized coalition behind mileage-based fees with an agenda and a plan. There is no such coalition, and that is a barrier.

- The current system is a barrier. We need to change how we do everything before we even get to this, including a performance-based approach to defining system needs and allocating revenue. If the message is that we need more money, then we need to say that we are going to spend it differently. This will take longer to convince people.

- The barrier is the current transportation planning process, which does not relate to a clear set of objectives. We first need to be clear about what our goals are and get that to the public. Start with performance-based planning and a planning process that reflects operation of the existing system, travel options, and pricing. The public does not trust the current planning system.

Question 2: What would the transition look like and who would lead?

- Federal support is needed for more pilot projects, including simple programs associated with other fees such as inspection or registration. Concurrently, other state and local funding options will be explored such as increasing and/or indexing the gas tax and tolls on roads not currently tolled. Parallel leadership is needed: Congress, departments of transportation (DOTs), the American Association of State Highway and Transportation Officials (AASHTO), and other professional associations addressing federal issues; and states addressing their own gas tax concerns.

- What we need is an empowered consortium, representing interests at all levels, to make technology and implementation decisions and plans, including definition of standards. Pilots are useful but will not cause us to converge.

- An interim system should be deployed in the next six years that involves reporting mileage through the state DMVs. This could involve computing approximate mileage through a radio frequency identification (RFID) tag at the pump and using a vehicle fuel efficiency rating to estimate mileage. Deployment costs for an interim system through the DMV are needed. There is also a need to explore other options for a non-GPS after-market device to allay privacy concerns.

- We need to talk to people county by county—without articulating a specific solution—and let people tell us what they want. Then you have a clearer base to explain what the options are.

- First, talk to the public to identify the "value proposition"; then define federal, state, and local roles in implementing. The federal government should facilitate innovation at the state/local level focusing on standards development, system architecture, business models, and concepts of operation. Congress should be

seeking to creatively leverage existing resources through industries such as telecommunications and banking. For example, engage the financial industry to lower transaction costs. Finally, look for agencies and institutions that will administer pilots on a multi-state basis.

- States will initiate the transition process, but federal leadership will be needed after state pilot projects are performed.

- There is a great need to define and reach a basic understanding of the general rate structure for individual users and system costs.

- AASHTO and its partners should lead state DOTs in coordination with state DMVs in a transition effort on an odometer reading system. This approach will work with different types of vehicles. Additional registration fees (state, federal, or local) could be implemented to support expenses.

- Proceed with interim pilots on a voluntary basis with seed money from the federal government, followed by a decision at the federal level as to the best system for a national deployment.

- There is a need for a national commission; otherwise no one will make a decision. User fees will be easier to collect if they are revenue neutral, but this is the conundrum: raising revenues for transportation means we need to increase fees. As a result, there is some ambivalence over an interim system because that would most likely need to be an augmentation over and above the gas tax.

- Ideally, the federal government would seize the bull by the horns and run with it, developing technical standards, running bigger and better pilot programs, sponsoring research and development efforts, etc. The reality is that it is going to be a more decentralized effort with the states as the early movers. In this reauthorization, more pilots should be done, but work needs to be done toward an implementation plan in the following reauthorization. Some type of implementation commission is warranted, something outside of but working closely with DOTs in making recommendations.

- The federal government should enable pricing in various forms at the state and local levels through the next reauthorization. The states need to figure out how to incorporate pricing more into how they do business. Industry needs to work on the technology. If the technology offers a whole new range of services that includes payment of fees, you would see how it could perform through a next phase of pilots.

- The motor fuel tax is a foundational tax that cannot be ignored. Gas taxes may be with us until we use the last drop of gas. The public likes it. So first, we need

to recognize and explain why we are replacing it. The transition needs to be incremental. Start with classes of vehicles that we are not collecting on or under-collecting on. Start small.

- Agree today that the general revenue fund will support the trust fund deficits. Agree today that the gas tax will be increased in two years. Agree today that we will phase out the gas tax by 2020 and transition to VMT fees. Set up a commission to develop a road map for doing this. Agree today that expenditures will now be performance based. Take away barriers that currently exist with regards to tolling and make it a local issue. Conduct pilot demonstrations to facilitate national standards development. A logical starting point is heavy trucks. Clear away state insurance regulations to enable pay-as-you-drive insurance.

- We are lacking policy directives. There is a need for basic policy direction from Congress. This enables state and local agencies to point to what you are trying to achieve.

- We need guiding principles. A national group or commission should be implementation oriented, with state and local entities engaged with the involvement of universities.

- A national commission should provide several interim reports to Congress as a way to move quickly without making rash judgments.

- Funding issues are fundamental, especially at the state and local levels. This cannot be viewed as a national program. It is like an eggs-and-bacon breakfast: the chicken (federal government) is involved, but the pig (states) is committed.

Question 3: What additional research, testing, and demonstration are needed?

- We definitely need additional research and demonstration. First, determine the primary objectives. Next, determine a framework for implementation. The auto industry could be involved in testing. With all due respect to the federal government, there is a state tax. States will do what they need to do to address the sustainability of their state fuel taxes.

- There is broad consensus that VMT fees are needed, so research should help define objectives. What are key objectives? Secondary objectives? Overarching objectives should be identified before starting multiple pilots. If we make a massive concentration of pay-as-you-go type services, a demonstration could be self-supporting through the private sector. Building trust would be one of the objectives of a demonstration. If such a demonstration works, then you could

toll the United States for free using money from parking, which is politically easier to access than the VMT fees.

- The federal government should prepare a series of "concepts of operations" identifying conceptual system designs ranging from minimal to high functionality. This will give the states various frameworks to choose from in conducting pilots. The federal government can evaluate. This is something FHWA can begin doing right away. It will begin the process of framing the capabilities and cost. Developing concepts of operations would not be trivial; it would take time, but then we would be ready to go. Standards are also important. Right now the federal government does not have the authorization to develop these standards. We can set safety-based standards.

- There is a need to research vehicle fuel efficiency and its relationship to income in order to better understand equity issues. Is the current fuel tax–based system equitable? Do higher income people have higher fuel-efficiency vehicles?

- Research is needed in the area of public acceptance. We need to understand the resistance to gaining public support for the notion of mileage-based fees. There is work to be done on building trust. In addition to proving technology, is there a way to marry public acceptance and technology through value-added services?

- States may also require enabling legislation. I suggest we start with near-term implementation with a DMV in a DOT as a pilot.

- We need more research on what it is we are actually trying to do. I have questions about pursuing VMT fees if it turns into a social engineering experiment. Insurance should not be part of this discussion. I think a national commission only works with clearly articulated goals. There have been two commissions on national transportation, and neither have done what they were supposed to do. Research is needed to identify what we are actually trying to accomplish.

- Start with the toll industry. A national toll alliance already exists. The Alliance for Toll Interoperability represents 35 to 40 toll agencies and would be a good candidate for a possible demonstration.

- Research is needed on options available for people in areas where technology may not necessarily work. Rural residents may not all have cell phones, credit cards, etc., so there will need to be accommodation for those individuals, including those who choose not to be tracked. Add true rural/local representation to the discussion.

- Research the fairness gaps with an honest conversation with the public. Ask them what they think is most fair. Have an honest dialogue about the need to

generate new revenue. Let them help us define what funding mechanisms should exist.

- A white paper should be prepared that answers some fundamental questions: How will this improve lives? What are the real costs? What are the benefits? How will it improve the economy? How will it improve efficiency?

- Use designated strategic planning and research programs at state DOTs as a mechanism to perform more research. State DOTs should put these ideas into their research programs. The programs are there, and they do not need to be looking only at asphalt and bridges.

- Conduct pilots with multiple platforms.

- There is a need to conduct more research on how to bundle services with VMT fees to lower the cost. An isolated VMT fee system will be inefficient. Research is needed to determine how to use VMT fees to link to other services: parking, new mobility services, new rideshare programs, etc.

- Solve the political problem. Research what is necessary to make it more palatable to the public. We have the brain power to solve the math in this room. We have to do more than solve the math. The research needs to look at what makes the next guy accept a change in the way we fund transportation, including the packaging and added-value benefits. The general public will need to buy in.

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