# Oregon's Mileage Fee Concept and Road User Fee Pilot Program

FINAL REPORT



Oregon Department of Transportation

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# ACKNOWLEDGEMENTS

Though six years has passed, it seems like a long sprint from dead start to pilot program completion. Through various false starts, stumbles and new courses, the numerous contributors to the Road User Fee Pilot Program remained resolute. I cannot do justice to their contributions nor give adequate thanks. Each individual will always be fondly remembered.

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# PREFACE


**Oregon's adventure in developing the Oregon Mileage Fee Concept**—the new revenue platform tested in the Road User Fee Pilot Program—began during the 2001 Oregon Legislative Assembly. Early in the legislative session, members of the Oregon House Transportation Committee received the visual treat of a parade of alternative fuel vehicles developed by automobile manufacturers. The legislators examined early versions of the hybrid electric vehicle as well as cars fueled by natural gas, bio-fuels and an assortment of other alternative fuels, including a fuel cell concept car.

As the legislators toyed with these cutting edge vehicles, a question nagged at them—what would happen to state road revenues if Oregonians started buying and driving these new vehicles in large numbers? Aware of Oregon's heavy reliance on gasoline tax revenues, they intuitively knew the answer—Oregon's road system would be in jeopardy as the gasoline tax revenues necessary to maintain, preserve and modernize the system slowly but steadily drained away.

Few in the nation had seriously begun tackling this looming revenue hemorrhage. So, these transportation policymakers did what Oregonians have done for over 150 years since they first found themselves isolated at the end of the Oregon Trail. They proposed Oregon use self-reliance and imagination to find our own solution.

The Oregon Legislature drafted and passed a bill creating the Road User Fee Task Force, signed into law by Governor John Kitzhaber. The new law charged the task force with developing a new road revenue system alternative to the gas tax. The same legislation directed the Oregon Department of Transportation (ODOT) to administer the task force and run one or more pilot projects.

The mere name of the Road User Fee Task Force gives a clue as to the eventual outcome of its investigations into 28 different potential revenue sources. The central feature of the new system would be based on road use. While many tax and fee systems are built on a subsidy basis, meaning one set of fee or tax payers pay more so that another set of payers can pay less, the new system would directly connect to the burden each particular user places on the road system. Therefore, the amount paid would be a "fee for service" rather than a general tax unrelated to use.

The task force developed the Oregon Mileage Fee Concept to solve all major requirements for a new revenue system, including adherence to good tax policies. The Oregon Concept proposes to employ existing technology in a new way and institute critical administrative processes that allow for a fully functioning system seamlessly integrated with gasoline tax collections. As designed, the new system should be affordable to implement statewide, enforceable and provide system redundancy in the event of technology glitches. Finally, and most importantly, the new mileage charging system will be easy on the motorist, who does only one new thing—the motorist pays a new charge in the same old way.

While principally designed to replace the gas tax over time, the Oregon Mileage Fee Concept also provides an electronic platform for creative applications of congestion pricing to manage levels of traffic during peak periods of driving. In other words, the concept accommodates creation of multiple "zones" that allow not only local option but also various pricing methodologies. The pilot program successfully tested "area pricing" but this conceptual system could expand to allow a virtually unlimited number of congestion pricing applications, not only area pricing but also cordon pricing, distance or point tolling of individual facilities and time-of-day pricing of on-ramps to limited access highways, or combinations—most without roadside infrastructure. Indeed, congestion pricing strategies could be tailored in ways that fit the individual natures of urban communities. These strategies could be phased in over time as congestion management needs surface.

The recently concluded Road User Fee Pilot Program is the first field test of the Oregon Mileage Fee Concept. While oriented to prove the concept, it must be noted that this field test necessarily sacrificed certain elements of the Oregon Concept as a matter of practical necessity. Since the field test was of temporary and limited duration, the on-vehicle devices could not be manufactured into the vehicles. Nor could the volunteer motorists' vehicles be permanently changed in any way. Furthermore, alteration of the software of existing fueling stations' point-of-sale systems was not permissible under current legal or contractual authority.

As a result of these practical constraints, the field test retrofitted temporary, prototype on-vehicle devices into vehicles privately owned by volunteer participants, employed lab-generated data transmission technology and jury-rigged modifications to existing fueling station systems. Problems occur under such circumstances but the overwhelming bulk of the difficulties were associated with these temporary measures. The remaining difficulties are associated with technologies for which further refinements are achievable or more effective alternatives are readily available.

The technological theory behind the Oregon Mileage Fee Concept remains sound. Most importantly, the necessary critical administrative elements of the concept—tedious though they may be—worked like clockwork. The Oregon Department of Transportation concludes that the Oregon Road User Fee Pilot Program tested the critical elements of the Oregon Mileage Fee Concept and yielded the result—*Concept Proven.*

James Whitty
Salem, Oregon
November 2007

# Road User Fee Pilot Program Results Summary

## BACKGROUND

The 2001 Oregon Legislature established the Road User Fee Task Force "to develop a design for revenue collection for Oregon's roads and highways that could replace the current system for revenue collection." After considering 28 different funding ideas, the task force recommended that the Oregon Department of Transportation conduct a pilot program to study two strategies called the *Oregon Mileage Fee Concept*:

(1) Study the feasibility of replacing the gas tax with a mileage-based fee based on miles driven in Oregon and collected at fueling stations; and

(2) Study the feasibility of using this system to collect congestion charges.

ODOT launched a 12-month pilot program in April 2006 designed to test the technological and administrative feasibility of this concept. The program included 285 volunteer vehicles, 299 motorists and two service stations in Portland.

## KEY FINDINGS

**The concept is viable**

The pilot program showed that, using existing technology in new ways, a mileage fee could be implemented to replace the gas tax as the principal revenue source for road funding. At the conclusion of the pilot program, 91 percent of pilot program participants said that they would agree to continue paying the mileage fee in lieu of the gas tax if the program were extended statewide.

**Paying at the pump works**

The pilot program showed that the mileage fee could be paid at the pump, with minimal difference in process or administration for motorists, compared to how they pay the gas tax. Like the gas tax, collection of the mileage fee can be embedded within routine commercial transactions, with the bulk of it pre-paid by the distributor in the form of the gas tax. By including the mileage fee in the fuel bill, cash or credit payments are accommodated, just like the gas tax. Although many of the prototype components used in the pilot program did not, by definition, meet the standards of commercial products, the next stage of technology development would take the technology to commercial viability.

**The mileage fee can be phased in**

The study showed that the mileage fee could be phased in gradually alongside the gas tax, allowing non-equipped vehicles to continue paying the gas tax, while equipped vehicles could pay the mileage fee. Retrofitting vehicles with mileage-calculating equipment appears expensive and difficult.

**Integration with current systems can be achieved**

The study demonstrated the ability to integrate with two main existing systems: the service station point-of-sale (POS) system and the current system of gas tax collection by the state.

**Congestion and other pricing options are viable**

The study showed that different pricing zones could be established electronically and the assigned fees could be charged for driving in each zone, even at particular times of day. This proves the mileage fee concept could support not only congestion pricing but also assessment and collection of local revenues and other "zone-oriented" features. Furthermore, the area pricing strategy applied in the pilot program produced a 22 percent decline in driving during peak periods.

**Privacy is protected**

Many levels of privacy protection can be implemented in a system similar to that used in the pilot program. There is a trade-off between privacy and information stored for enforcement and dispute resolution. ODOT developed the system used in the pilot program with specific engineering requirements to maintain as much privacy as practicable while still allowing a feasible way to audit and challenge billings. Key privacy related requirements for the pilot program were:

- No specific vehicle point location or trip data could be stored or transmitted
- All on-vehicle device communication must be short range
- The only centrally-stored data needed to assess mileage fees were vehicle identification, zone mileage totals for each vehicle and the amount of fuel purchased

**The system would place minimal burden on business**

While distributors and gas stations bear some new accounting burdens, administration is essentially automated and can be integrated easily into existing transaction processes.

**Potential for evasion is minimal**

Tampering with the on-vehicle device would result in default payment of the gas tax. The difference between gas taxes and mileage fees would likely be very small, providing very little incentive to try to evade the basic mileage fee. The eventual fee level, on-vehicle engineering, fee structure, fuel tax rates and penalties for tampering will determine the degree to which equipment tampering will occur.

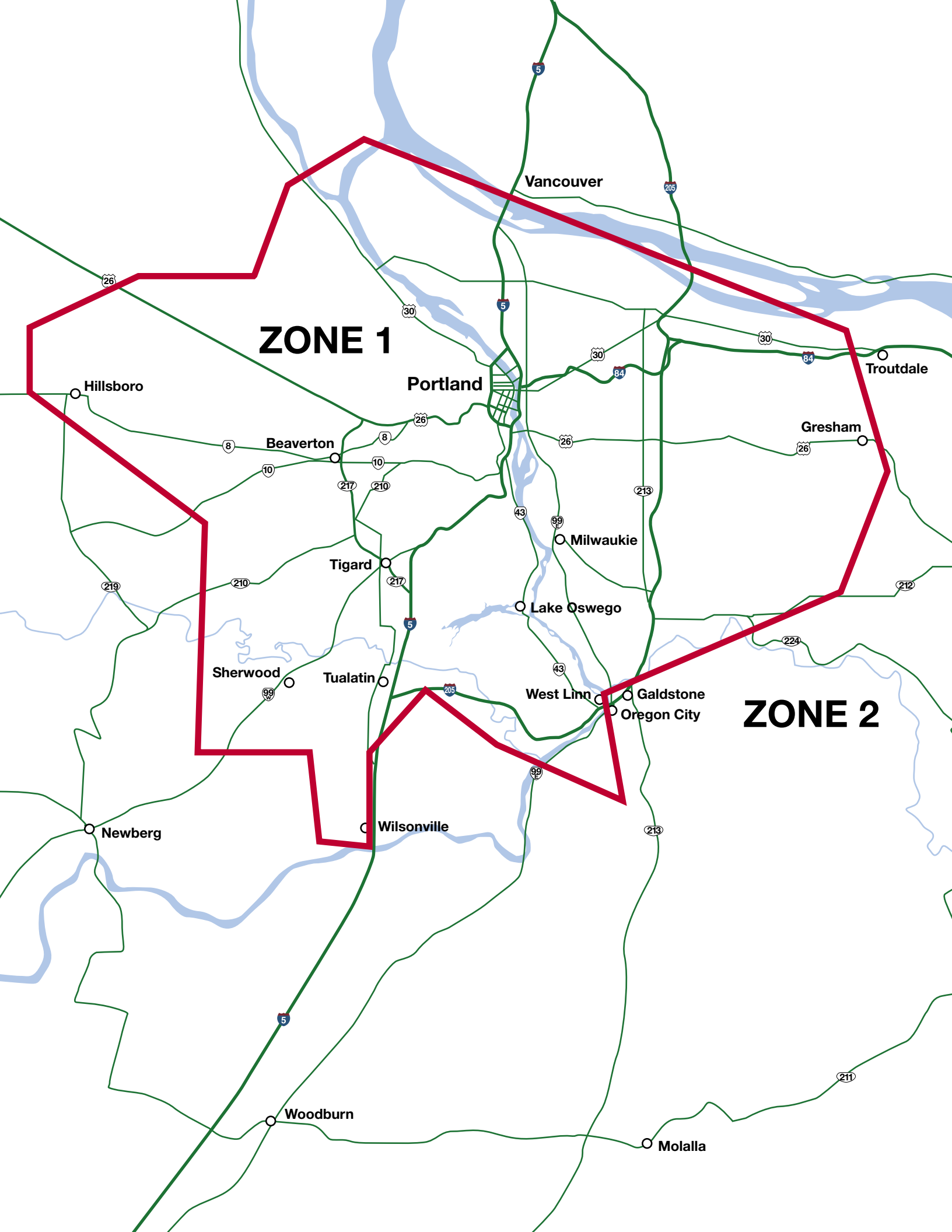
**Cost of implementation and administration is low**

Costs originate from three areas: service stations, on-vehicle and DOT administration. Service station capital costs include installing the mileage reading equipment while operating costs include communications of the mileage information with a central database in order to calculate mileage fees and modifications to the station's point-of-sale system. On-vehicle capital costs will be determined by auto manufacturers and included in the price of new vehicles. ODOT will incur operating costs for auditing and providing technical assistance to service stations and motorists. Auditing should cost $1.0 million annually, a small fraction of expected annual mileage fee revenue.

## NEXT STEPS

Additional development and testing would have to take place to prepare for full implementation.

- ODOT would have to work with technology firms and automobile manufacturers to refine on-vehicle technology, and work with the fuel distribution industry to insure ease of mileage fee transactions at the fuel pump.
- ODOT would have to expand the concept to include home fueling collections and multi-state integration.
- ODOT would have to develop cost estimates for full implementation, which could occur within the next 10 years.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CHAPTER 1

# Introduction and Background

This report summarizes and assesses the results of Oregon's Road User Fee Pilot Program, which concluded March 25, 2007. It also identifies lessons learned and outlines the next steps toward implementation of a per-mile charge to replace the Oregon state fuel tax on gasoline[1] (also referred to as the gas tax) as the principal method for funding Oregon's road system.

Structured as a stand-alone report, this document provides the background, rationale and policy development behind the Oregon Mileage Fee Concept so that legislators, concerned Oregonians, and observers beyond our borders can understand the context for the Road User Fee Pilot Program that tested it. They may also use this document to judge the validity of the Oregon approach.

The six-year history of this program produced more technical, policy and administrative background than can be presented in this report. Interested readers are invited to refer to previous reports to the Oregon Legislature and the numerous technical documents dating back to 2001, which detail each step building the foundation for the Pilot Program.[2]

## Exploring the future: Oregon's Road User Fee Task Force

Oregon became a road finance pioneer in 1919 as the first state to enact a gas tax during the nation's early phase of auto-related road building. Now the gas tax revenue which built the current system is in peril. Gas tax-generated revenue is eroding primarily from increases in fuel efficiency, resulting in more roadway usage per vehicle mile traveled (VMT), and inflation.[3] Nearly nine decades after having initiated a pay-as-you-go user fee for roadway finance, Oregon must innovate once again.

After several failed attempts within a decade to increase the state gas tax, the Oregon Legislative Assembly passed authorizing legislation in July 2001, directing the Governor, Senate President and Speaker of the House to form a 12-member Road User Fee Task Force (task force).[4] The legislature charged the task force with designing a new revenue collection strategy that could replace the gas tax with a long-term, stable source of funding.

## Task force composition and decision making

The legislature determined the task force composition as follows:

- Two members of the Senate, appointed by the President of the Senate.
- Two members of the House, appointed by the Speaker of the House.

*The legislature charged the task force with designing a new revenue collection strategy that could replace the gas tax with a long-term, stable source of funding.*

1 *Through this report, there will be references both to the "fuel tax" and to the "gas tax." A fuel tax is an excise tax paid per-gallon, rather than a percentage of sale price, that covers a broad category of fuels, including gasoline, but also diesel, various forms of natural gas, propane, etc. The gas tax is quite simply a fuel tax on gasoline. Each fuel has its own tax rate.*

2 *Reports and technical documents can be accessed in electronic form at http://www.oregon.gov/ODOT/HWY/OIPP/rufif_reports.shtml.*

3 *By 2003, gas tax revenues in "real cents per VMT" had declined by half since 1970.*

4 *See Appendix A for House Bill 3946 (2001).*

- Four members appointed by the Governor, Speaker and President, acting jointly, and representing highway user groups, the telecommunications industry, as well as Oregon and national transportation research communities.
- One elected city official, appointed by the Governor, Speaker and President, acting jointly.
- One elected county official, appointed by the Governor, Speaker and President, acting jointly.
- Two members of the Oregon Transportation Commission, appointed by the Commission Chair.[5]

Throughout its deliberations, the task force was chaired by the bill's sponsor, Senator Bruce Starr (R-Hillsboro).[6] Although mere majority support was required for official action, the task force's custom was to reach full consensus on all decisions. This combination of broad representation from Oregon public and private sectors, and consensus-based decision making, provided balance and depth to policy decisions and established legitimacy with the state legislature for task force recommendations.

## Criteria for new revenue sources

The task force established several sets of criteria, developed for distinct phases of program development, to guide ODOT staff efforts toward a new revenue system design and ultimate implementation of an alternative to the gas tax. The task force considered eight overarching criteria that comprise a set of principles essential to an acceptable new revenue source for Oregon. These criteria are:

**Users pay.** Any new revenue system should be founded upon user pay methods that directly relate to provision and use of road infrastructure and services.

**Local government control of local revenue sources.** The state should not appropriate revenue sources that are traditionally and primarily the province of local governments.

**Revenue sufficiency.** The new revenue system must have the ability to raise sufficient revenue to allow replacement of the gas tax as the primary revenue source for Oregon roads.

**Transparent to the public**. A new revenue source should be visible to the persons paying it. Individual members of the public should know how much they pay in taxes or fees and understand how any new assessment is calculated.

**Nongovernmental burden.** A new revenue source should not impose substantial burdens either on taxpayers or on private sector entities involved with tax, fee or data collection.

**Enforceability.** A new revenue source must be readily enforceable, resulting in minimal tax evasion.

**Support entire highway and road system.** A new revenue source should be designed to support the operation, maintenance and preservation of the highway and road system for the state, cities and counties in all parts of the state, as the gas tax does today.

**Public acceptability.** A new revenue source should be acceptable to the public.

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5 *See Appendix B for task force members.*

6 *Representative Bruce Starr was elected chair of the Road User Fee Task Force in 2001 and subsequently maintained his position as chair after his election to the state Senate in 2003.*

## Task Force recommendations on alternative roadway revenue strategies

Between 2001 and 2003, the task force met nine times to develop evaluation criteria, explore a range of user fees, identify promising strategies and eliminate other potential funding methods deemed inappropriate or unworkable. Those fees which appeared most stable and fair were retained for evaluation as gas tax replacements. The following funding mechanisms are now under investigation.[7]

### MILEAGE FEE

This type of distance-traveled charge (also known as VMT fee or per-mile charge) is imposed according to the amount a vehicle uses the road system. The task force considers the mileage fee to be the principal general revenue source for a new system that would ultimately replace the gas tax for road funding. Oregon's version of this per-mile charge—the Oregon Mileage Fee Concept—was the subject of the recently completed year-long pilot program, the evaluation of which is summarized in the remainder of this report.

### CONGESTION PRICING

Congestion pricing (also referred to as peak period pricing, road user charging or value pricing) assesses the owner/operator of a motor vehicle a charge for using certain roadways during periods of high congestion. This can be accomplished either through an independent electronic system using roadside readers, or as a rate adjustment to an electronically-collected mileage fee, or a combination, for time-of-day travel in specific geographic areas where congestion prevails.

### TOLLING NEW CAPACITY

This strategy would toll any new (rather than existing) road, bridge or extended lane, to the scope practicable, to cover costs of construction, maintenance and operation of the facility. ODOT and the Oregon Transportation Commission are currently engaged in exploring the feasibility of tolling various highway projects in Oregon.

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7 *A studded tire fee was also initially approved as part of a comprehensive new revenue system to fund highway needs. A studded tire fee would be charged to owner/operators of motor vehicles using studded tires for the damage their use directly causes to the road pavement. The task force introduced studded tire fee legislation in the 2003 Oregon Legislative Assembly without success and subsequently recognized the market was moving away from studded snow tires toward viable alternatives.*

CHAPTER 2

# The Oregon Mileage Fee Concept: The Challenge of Topping the Gas Tax

From the standpoint of tax policy, the gas tax is close to perfection. Nearly all the hallmarks of good tax policy can be found in Oregon's efficient gas tax collection system. The gas tax has the inherent flaw, however, of lacking a direct nexus to road use. As a consequence of this flaw, it will become obvious in 10-15 years, if not earlier, that the gas tax has failed its originally intended purpose as a reliable source of revenue for the state's road system.[8]

To create a viable new road revenue system alternative, ODOT worked with the Road User Fee Task Force in 2002 to design a mileage fee collection system that maintains as many of the positive attributes of the gas tax as could reasonably be adapted while solving its fatal flaw. During ODOT's investigations, the following characteristics of the gas tax became apparent.

## Advantages of the gas tax

**Raises substantial revenue.** Provides approximately 60 percent of Oregon road revenue (combined state and federal).[9]

**Ease of payment by consumer.** Payment is included in fuel bill and allows cash or credit payment.

**Ease of collection.** Embeds collection within commercial transactions paid by distributor, reimbursed by retailer and, in turn, by consumer.

**Easy to administer.** Distributors comprise a small number of taxpayers.[10]

**Low cost of administration.** Auditing costs the state only $1 million annually.[11]

**Minimal evasion potential.** Illegal gasoline sales are rare in Oregon.

**Protects privacy.** Paid anonymously by consumer.

**Minimal burden on business.** Retail businesses bear only the burden of lost revenue from evaporation of gasoline after purchase from a distributor and before sale to a customer.

## Disadvantages of the gas tax

**Disconnection to highway system.** Not directly connected to the burden the vehicle places on a state highway system and therefore unable to support any form of road user charging.

**Revenue erosion.** Vehicle fuel efficiency improvements reduce gas tax payments per vehicle mile traveled.

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8 *See Appendix C for potential impact of fuel efficiency over time.*

9 *Oregon's overall exposure to fuel tax collections is actually much greater than 60 percent of the total road revenue collections. Owing to a provision in Oregon's Constitution requiring road cost allocation, total fuel tax collections directly affect the level of the tax rates for the weight-distance tax and registration fees for heavy trucks. This means that approximately 80 percent of total state road revenue is dependent upon receipts from the fuel tax.*

10 *Oregon currently receives fuel tax payments from 157 distributors.*

11 *See Appendix D for more information on auditing costs.*

## Task Force formation of the Oregon Mileage Fee Concept[12]

At the onset of structuring a mileage fee collection system for testing, the task force recommended ODOT develop the configuration according to designated criteria. It was determined the central criterion should be that only mileage driven in Oregon should be charged. This decision required the application of electronic data gathering to "turn the charging off" when a vehicle left the state. With electronics now an issue, the task force required the technology employed be accurate, reliable, secure and feasible. The task force also wanted the technology applied in a way that protected the privacy of motoring Oregonians to levels expected by the public. To the extent retrofitting of technology into currently owned vehicles was desired, the task force determined the retrofitting should be affordable.

As for the mileage fee collection system itself, the task force determined the system, as structured, should provide minimal opportunity for evasion of the charge. The system should also place a minimal burden for administration of the mileage fee collections on the private sector. In accordance with good tax policy, the task force declared that operational costs for the new system should not be a substantial percentage of total revenues raised. Finally, they expressed their preference for a seamless transition that would allow very little loss of revenue while switching from fuel tax collections to mileage fee collections.

While working to structure a viable system configuration for mileage fee collections, ODOT noted several additional structural issues for resolution. Depending upon the system employed, collection enforcement could become problematic and prohibitively expensive. Designated as a replacement for fuel taxes, a mileage fee system had to provide an offset or credit for motorist fuel tax payments at the fuel pump because no motorist would pay both charges. It also became apparent that a system reliant on technology should be designed with redundancy included so that a technology breakdown would not result in complete revenue failure. Finally, in order to obtain public acceptance, a new mileage fee system should be easy for the motorist to use. Motorists should be required to do as few

new things as possible. Adding only one new thing for the motorist to do would be best.

## Electronic collection possibilities

Having abandoned human gathering of mileage data because of an inherent inability to limit collection only to mileage driven in Oregon and other practicable reasons,[13] the task force turned to analysis of electronic collection systems. Realistic possibilities for electronic collection boiled down to centralized collection and fuel pump collection. Centralized collection involves transferring data to a center that sends periodic billings to the motorist. Fuel pump collection involves transferring data while at the gas pump and payment as part of the fuel purchase. To assist the task force in analyzing various versions of central collection and fuel pump collection, ODOT prepared six scenarios for mileage data and fee collection systems.[14]

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12 *See Appendix E for a graphic illustration of the development process leading to the Oregon Mileage Fee Concept.*

13 *The task force determined that self reporting of odometer readings would produce extensive opportunity for fraud and therefore costly enforcement measures. The task force also noted the great cost and inefficiency associated with third party odometer checking. Furthermore, human data gathering allowed no gas tax offsets or credits and was not motorist friendly.*

14 *James M. Whitty,* Road User Fee Task Force Report to the 72nd Oregon Legislative Assembly, *March 2003, p. 27. http://www.oregon.gov/ODOT/HWY/RUFPP/ruftf_reports.shtml.*

To better inform selection of a collection scenario for pilot testing, ODOT contracted with research consultants from Oregon State University (OSU) and Portland State University (PSU) to develop cost and qualitative functionality parameters for the six data and fee collection scenarios.[15] This research enabled more detailed assessment and screening of the six mileage fee collection scenarios, and multiple associated technology options, to a manageable size.

Though the task force initially preferred centralized collection, research exposed huge operational costs for this option. Although effectively employed for modern electronic tollways, central data collection and billing centers become surprisingly expensive to operate when extended to a mileage fee system employed statewide rather than to a single high volume facility.[16] Cash payments are also problematic because while most tollways allow cash payments in some form, centralized collection would not easily accommodate cash collections of a broadly dispersed mileage fee. ODOT also pointed out that motorists may accept an expensive administrative cost when they choose to drive on a tolled highway but will likely not accept such a high administrative cost to drive on non-tolled highways.

The research on centralized collection presented the task force with other practical difficulties as well. Central billing of a per-mile rate turns collection into something similar to public utility collections but with a key difference of lacking the ability to provide a direct and immediate consequence for failure to pay. Public utilities can shut off power, water or garbage for nonpayment. Since transportation agencies cannot currently shut off access to the road system, the non-paying motorist has no direct and immediate incentive to pay the bill. An extensive and expensive debt collection effort would be required to make centralized collection viable. Even then, there would be a sizable bad debt load that either will result in less revenue for the system or a burden that other payers will have to carry. All this adds to the cost of operations.

Another flaw of centralized collection involves lack of integration with fuel tax collections. Since implementation of the mileage fee will require a long phase-in period, a complete mileage fee collection system must find a way for some motorists not to pay both charges (mileage fee and fuel tax) while other motorists pay only one (the fuel tax). Centralized collection does not have an ability to allow for direct offset or credit of the fuel tax paid by mileage fee payers. The way to manage this problem is to provide a credit against some other tax or fee payment, such as the income tax or auto registration fees, surely a cumbersome and non-user friendly approach.

Finally, centralized collection places additional burdens on the motorist. Not only is the motorist asked to pay a new charge but then must also pay a periodic bill. For motorists with access to a bank account or the Internet, this may only be a minor bother. For those members of the cash economy—about 30 percent by some estimates—regular payment can become a significant burden.

Fuel pump collection of the mileage fee has none of the problems associated with centralized collections. Since mileage fee payments would be embedded in fuel purchases, additional operational costs would be nearly nonexistent.[17] ODOT auditing costs would be about the same as for the gas tax.[18] Collection

15 *This research involved investigating technology interoperability and functional requirements, system integration options, enforcement, revenue and debt collections, flexibility, public perception as well as capital and operational cost estimates for the six data and fee collection scenarios identified. These research reports are David S. Kim et al.,* Technology Evaluation for Implementation of VMT Based Revenue Collection Systems, *November 2002. Robert L. Bertini et al.,* Data Transmission Options for VMT Data and Fee Collection Centers, *November 2002. Anthony M. Rufolo et al.,* Institutional Options for VMT Data and Fee Collection Centers, *November 2002. http://www.oregon.gov/ODOT/HWY/RUFPP/rufpp_reports.shtml.*

16 *Whitty, p. X-1. Rufolo, p. VII.*

17 *Whitty, p. X-1.*

18 *See Appendix D for more information on auditing costs.*

of mileage fees at the fuel pump also raises fewer enforcement issues because access to fuel can be conditioned upon payment of the mileage charge. No payment, no gas.

The most positive attribute of a fuel pump collection system for the mileage fee is ease of use by the motorist. The motorist who pays the mileage fee at the pump does the same thing as before—he pays the fuel bill after refueling, either by cash or credit. The only thing new is the type of charge paid—the mileage fee.

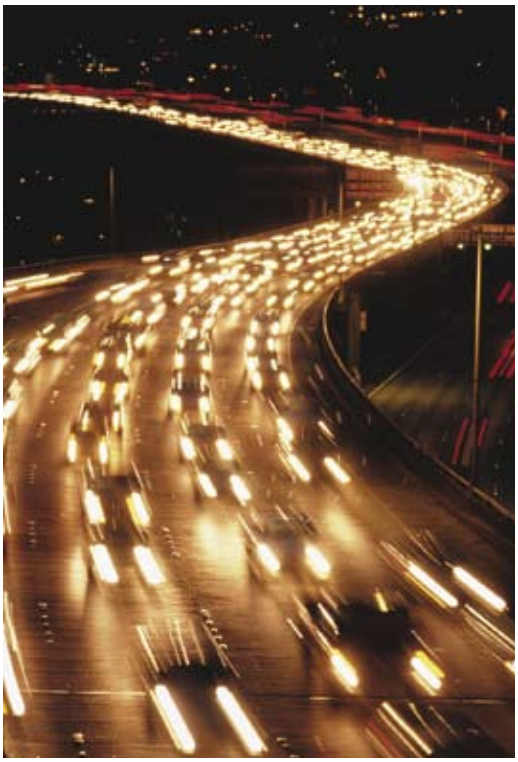
As a result of the number of troublesome difficulties with centralized data and fee collections and the promise of fuel pump collections, ODOT recommended the task force alter its initial preference for centralized data and fee collections to allow pilot testing of essential components of a fuel pump collection system. The task force accepted this recommendation.

## Creating a mileage fee concept by emulating positive attributes of gas tax collection

The task force's decisions on the technical elements for testing in a pilot program provided most of the necessary components of a complete mileage fee concept, but one was missing. The missing component was a way to integrate the mileage fee into the gas tax collection system.

ODOT grew concerned that collection of the full mileage fee by the service station retailer for remittance to ODOT presented numerous difficult accounting and gas tax coordination issues. Since the distributor pays the gas tax to ODOT at first point of wholesale distribution in the state and the retailer reimburses the distributor and the motorist, in turn, reimburses the retailer, payment of a mileage fee at the pump confounds the gas tax payment system. Without systemic integration, the mileage fees paid to the retailer at the pump will rarely match up with the corresponding amount the retailer paid to the distributor for the fuel pumped into the car. The retailer will either receive more than paid to the distributor or less.

At this point, ODOT had not solved the troublesome issue of providing an easy way to offset or credit for gas tax payments by mileage fee payers as part of the fuel purchase. Finally, ODOT had the concern of replacing a reliable tax system for about 150 taxpayers/



distributors (the gas tax system) with a less reliable revenue system for millions of motoring fee-payers (the mileage fee system).

In June 2003, the project team provided the analytical breakthrough that solved all these problems.

### VMTCAR—VEHICLE MILES TRAVELED COLLECTED AT RETAIL

The breakthrough innovation was an electronic accounting and communications system ODOT calls Vehicle Miles Traveled Collected at Retail (VMTCAR).

In essence, VMTCAR treats part, or all, of the motorist's mileage fee payment as pre-paid by the distributor in the form of the distributor's gas tax payment to ODOT.[19] The service station retailer does not remit the total mileage fee paid by the customer to ODOT because the retailer has already reimbursed that portion covered by the fuel purchase amount to the

19 *Depending upon the fuel efficiency of the vehicle fueling up and the mileage fee rate adopted by the legislature, some motorists may pay a greater mileage fee bill at the pump than the retailer paid the distributor in fuel tax reimbursement for the fuel purchased. On the other hand, some motorists may pay a smaller mileage fee bill at the pump than the retailer paid the distributor in fuel tax reimbursement for the fuel purchased.*

*Collection of mileage fees at the fuel pump also raises fewer enforcement issues because access to fuel can be conditioned upon payment of the mileage charge. No payment, no gas.*

*Although designed to replace the fuel tax, the platform employed is tremendously flexible and can easily accommodate county or city options or congestion pricing without photographic or tolling-style infrastructure.*

distributor (who already paid the amount to ODOT as gas tax at the first point of wholesale distribution in the state).[20] Thus, the only amount the retailer remits to ODOT is the differential between the pre-paid gas tax and the mileage fee. VMTCAR provides the electronic accounting mechanism for managing payment of this mileage fee differential through a periodic reconciliation— or truing up—between ODOT and the service station retailer.[21]

The VMTCAR administrative system for mileage fee collection at gas stations provides the desired seamless integration with gas tax collection. This system makes the mileage fee collections fair to the retailer, provides a way for motorists to avoid paying the gas tax when they pay the mileage fee and, most importantly, maintains the bulk of the mileage fee payment system as pre-paid by a reliable taxpaying sector—the distributors. In this way, retail payment of the mileage fee gradually gains predominance as a key feature of Oregon's road revenue system.[22]

The Oregon Mileage Fee Concept was now complete for testing in a pilot program.

## Description of the Oregon Mileage Fee Concept

In the Oregon Concept, mileage data and fee collection occurs at the fuel pump. Within the vehicle, an on-vehicle device identifies zones for allocation of miles driven within various pre-identified zones. At the fuel pump, the stored mileage totals driven in each zone are electronically transferred to the station's point-of-sale (POS) system for application of the mileage fee rates. The station attendant presents the motoring customer with a bill for payment that includes both the mileage fee and the fuel purchase price less the state fuel tax. Motorists only pay for mileage driven within Oregon. Non-equipped motorists pay the state fuel tax.[23] Although designed to replace the fuel tax, the platform employed is tremendously flexible and can easily accommodate county or city options or congestion pricing without photographic or tolling-style infrastructure.

## Key design elements of the Oregon Mileage Fee Concept

### TRANSPARENCY AND EASE OF USE

The system for collection of mileage fees at the pump as part of the fuel purchase accomplishes the goal of transparency because the fee is obvious to the motorist. The mileage fee becomes obvious for two reasons: (1) the on-vehicle display screen identifies the zone in which a motorist travels so the motorist can immediately understand the impact of his or her driving choices; (2), the system communicates the fee rates at the time of fuel purchase so the motorist has frequent connection to the price impacts of his or her driving habits. The system is also easy to use because the motorist pays the mileage fee the same way he currently pays the gas tax—at the fuel pump.

### TECHNOLOGY CONFIGURATION

Although the Oregon Concept does not depend upon application of particular technology, certain available technology enables implementation better than others. This is more fully explained in Chapter 3.

To test the concept in a pilot program, ODOT contracted with OSU to develop new applications of existing technology. OSU developed applications of technology for electronic allocation of mileage within

20 *When the retailer takes in a greater amount than paid for all customers over a given period, the retailer will owe ODOT the difference. When the retailer takes in a lesser amount than paid for all customers over a given period, the retailer gets a reimbursement payment from ODOT.*

21 *See Appendix F for a graphic illustration of this process. Also see, James M. Whitty and Betsy Imholt,* Oregon's Mileage Fee Concept and Road User Fee Pilot Program: Report to the 73rd Oregon Legislative Assembly, *June 2005, pp. 35-39. http://www.oregon.gov/ODOT/HWY/RUFPP/rufff_reports.shtml.*

22 *See Figure 5-1 for the gradual growth of the mileage fee as a function of the total fuel taxes and mileage fees collected over 22 years from the beginning of statewide implementation.*

23 *Heavy trucks would not pay the mileage fee under the Oregon Mileage Fee Concept because Oregon's weight-distance tax for heavy trucks would be retained. Nevertheless, the Oregon Mileage Fee Concept could easily accommodate inclusion of heavy trucks if a legislature so desired.*

zones and for wireless transfer of mileage data to POS systems at fueling stations.

After investigating two technology configurations that could identify zones and tabulate miles,[24] ODOT and OSU ultimately settled on development and testing of a hybrid on-vehicle device that would utilize signals from satellites of the global positioning system (GPS) to identify zones but use the vehicle's odometer to tabulate miles. ODOT tested this hybrid configuration in the Road User Fee Pilot Program.[25] For transfer of a vehicle's identification and mileage data at the fuel pump, OSU proposed a wireless, electronic transmission where the data would enter the fueling station's POS system.

### MILEAGE FEE PAYMENT PROCESS

Mileage fee collection at the fuel pump must accommodate both mileage fee payers and non-mileage fee payers. When a transaction starts at a fuel pump, electronic readers automatically determine whether the vehicle at the pump contains the on-vehicle device associated with mileage fee collection. The process for completing fueling transactions and charging mileage fees, if applicable, occurs as follows:

1. **Vehicle detection.** When a fueling transaction begins, a central reader at the station detects the presence of vehicles equipped with the mileage fee technology. If no equipped vehicles are detected, the POS charges the gas tax and no more actions are required.
2. **Vehicle-to-pump association.** If the central reader detects one or more equipped vehicles, the central reader instructs the wireless devices on each fuel pump to broadcast a message that can be detected by on-vehicle devices. The vehicle's on-vehicle device then communicates the signal strength of the broadcast message from each fuel pump device to the central reader. The software controlling the central reader uses the signal strength information to determine whether an equipped vehicle is adjacent to a fuel pump. If so, and if the fuel pump determined by the controlling software is where the transaction started, then the process continues with step 3. Otherwise, the POS system charges the gas tax and no more actions are required.
3. **Read mileage data.** The central reader reads mileage from the on-vehicle device associated with the fuel pump where the transaction was started. The software controlling the central reader passes this mileage information and on-vehicle device identification number to the fueling station's combined mileage fee/ POS system.
4. **Central database lookup.** The mileage fee system queries the central database, via a high speed internet connection, to determine the vehicle's last mileage reading for each zone.
5. **Mileage fee calculation.** The mileage fee system extracts the fee rates from the central database and applies them to the difference between the vehicle's last and current mileage readings to calculate the mileage fee. The mileage fee system passes the mileage fee amount to the POS system. The POS system deducts the gas tax from the fuel purchase.
6. **Final receipt.** The receipt presented to the participant displays each amount involved in the mileage fee fueling transaction separately—fuel price (including gas tax), amount of gas tax deducted, and mileage fees. Figure 3-2 shows a sample receipt from the field test.
7. **Payment.** When the POS system indicates completion of the transaction, the central database updates with the latest mileage reading, the amount of fuel purchased, and the total mileage fee assessed.


### PHASING VS. RETROFITTING

For a mileage fee system to be employed in every vehicle at the beginning of statewide implementation, nearly all of the fee payers

*When a transaction starts at a fuel pump, electronic readers automatically determine whether the vehicle at the pump contains the on-vehicle device associated with mileage fee collection.*

24 *One technology configuration used an odometer-only device to tabulate miles through the vehicle speed sensor and identify zones through electronic interaction with roadside infrastructure. The other technology configuration used a receiver for signals from the Global Positioning System to both tabulate miles and identify pre-programmed zones.*

25 *The pilot program also tested the GPS receiver-only device during the field test. See Chapter 5.*

*The concept requires no transmission of vehicle travel locations, either in "real time" or of travel history. Accordingly, no travel location points are stored within the vehicle or transmitted elsewhere. Thus, there can be no "tracking" of vehicle movements.*

would need the required on-vehicle devices retrofit into their vehicles. Retrofitting on-vehicle devices into currently owned vehicles presents numerous technical difficulties because of the varied technology applied across all makes and models. Standard industry ports simply do not exist. For similar reasons, retrofitting of on-vehicle devices can be expensive because of the varied installation requirements for the various vehicle systems. As a result, ODOT is not currently developing retrofitting strategies for application during the early years of the phasing period.

Due to the unwieldy difficulties with retrofitting, the mileage fee would most likely be phased-in with many motorists continuing to pay the gas tax for many years after commencement of statewide implementation. The task force recommended applying a mileage fee only to new, fully equipped vehicles or newly registered vehicles entering Oregon for the first time that have the capability for either manufacture or post-manufacture application of the necessary technology.[26] A phased-in system must accommodate payers of both the gas tax and the mileage fee for the entire transition period, and perhaps even beyond as many out-of-state motorists will not have the necessary mileage fee technology in their vehicles when fueling in Oregon. Accordingly, older vehicles and out-of-state visiting vehicles would continue to pay the state fuel tax until they were retired from use or until retrofitting becomes practical.

Although retrofitting may be cost prohibitive over a short term implementation, there may be a point where it makes financial and policy sense to retrofit the remaining vehicles. For one thing, early application of retrofitting would have the advantage of allowing full implementation of peak period pricing under the mileage fee electronic platform. Despite the opportunity for full application at some point, it will likely make policy sense to maintain integration with the gas tax collection system even after every vehicle contains the necessary mileage fee on-vehicle equipment to guard against equipment tampering and provide system redundancy.

### PRIVACY PROTECTION

The task force and ODOT designed the Oregon Mileage Fee Concept for maximum protection of privacy for motorists within the context of audit-ability. ODOT designed all administrative policies, technology choices and institutional arrangements to protect against accidental or intentional invasion of privacy.

The concept requires no transmission of vehicle travel locations, either in "real time" or of travel history. Accordingly, no travel location points are stored within the vehicle or transmitted elsewhere. Thus, there can be no "tracking" of vehicle movements. Secured short distance transfer of mileage data occurs at the time of fueling. The task force directed the development of safeguards to prevent anyone other than the vehicle owner/operator from knowing the vehicle's movements without the vehicle owner/operator's consent.

Under the Oregon Concept, ODOT would have no involvement in developing the on-vehicle devices, installing them in vehicles, maintaining them or having any other access to them except, perhaps, in situations involving tampering or similar fee evasion activities. These on-vehicle devices would be managed as would any other device contained in a motor vehicle—essentially they are a private responsibility.

In order to allow auditing of transactions and consumer challenge of assessments, ODOT would acquire certain data at the time of fueling. ODOT would obtain the vehicle identification, the total miles driven in each zone since the last fueling and the amount of fuel purchased and where the fuel was purchased.

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26 *Under the Oregon Concept, out-of-state motorists migrating to Oregon after having purchased a vehicle that accommodates technology designed by the manufacturer for mileage fee collection would be required to have that technology installed as a condition of registration in Oregon.*

### ENFORCEMENT

Payment at the pump allows enforcement to continue as for the gas tax with evasion of the mileage fees minimized through pre-payment of the bulk of total mileage fees by the gasoline distributors. Furthermore, if a motorist refuses to pay the mileage fee assessment, the motorist would be denied access to fuel. If a motorist finds a way to prevent transfer of the identifying mileage fee data, the motorist would pay the fuel tax with only marginal benefit but with the added risk of criminal prosecution.

ODOT would have the ability to identify mileage fee evaders through accessing certain transmitted data during charging of the mileage fee at the fuel pump, as described above. Through electronic identification of the vehicles, ODOT would have the ability to compare earlier mileage fee payments, or non-payments, with gasoline purchases to determine whether a motorist is attempting to evade tax or whether a vehicle operates with a faulty device.

Hacking into the on-vehicle device can be deterred with appropriate placement design of the on-vehicle technology within the vehicle, making the device difficult to access. Blocking electronic signals or wireless transmissions can also be prevented through appropriate design. To date, ODOT has yet to devote a significant amount of resources towards resolution of security issues related to these devices and capabilities. ODOT plans to focus intensely on security issues during the next phase of work.

### CAPITAL COSTS

Capital costs were considered as part of the conceptual evaluation. ODOT's economist concluded in 2003 that the estimated $33 million in capital costs for statewide implementation would result in less than a two percent increase in the mileage fee rate, comparable to the existing fuel tax payment of the average passenger vehicle.

### MILEAGE FEE RATE STRUCTURE

Attributable to legislative preference, ODOT designed the Road User Fee Pilot Program to operate on a revenue neutral basis. Additionally, the task force preferred that the pilot program charge the mileage fee as a flat fee. In order to provide revenues that are equivalent, on a per-mile basis, to those deriving from the current 24-cent-per-gallon gas tax, ODOT found a flat (or average) mileage fee rate would be approximately 1.2 cents per mile.[27]

The task force deferred to the judgment of the Oregon Legislature for policy decisions about whether to raise additional revenue or provide an alternate rate structure to accomplish other policy goals. ODOT has researched various alternative rate structures that the Oregon Legislature might consider when investigating adoption of the mileage fee. This analysis may be particularly helpful when the legislature considers maintaining an incentive for motorists to "trade up" to fuel efficient vehicles. Structures to accomplish this include stacking a second energy consumption penalty rate on top of a flat mileage fee or maintaining the gas tax for vehicles that are fuel inefficient.[28]

### CONGESTION PRICING APPLICATIONS: AREA PRICING

The Oregon Mileage Fee Concept easily adapts to congestion pricing strategies for urban areas. Numerous strategies might be employed under this platform, including distance tolling of specific highways, point tolling of on-ramps to limited access highways or entry pricing into pre-defined geographic zones (cordon pricing), all without the need for a photographic enforcement system. This platform also accommodates "area pricing" where vehicles are charged a higher per-mile

27 *This is determined by dividing the current state gas tax of 24 cents per gallon by the 2004 average vehicle fuel efficiency of 20 miles per-gallon. Whether to index the base rate to adjust for inflation is a major policy issue.*

28 *Whitty,* Report to the 73rd Oregon Legislative Assembly, *2005, pp. 43-44.*

*The objective was to test, as closely as possible, elements of a system that could actually be implemented statewide. ODOT designed the pilot program, therefore, not as a test of theory but rather as a test of practicability.*

rate for driving within a designated congestion zone during periods of high congestion.

The task force preferred area pricing for the Oregon Concept because of the nature of the state's geography, road system configuration and land use policies and the ease of technological integration into the mileage fee collection system. Nevertheless, the electronic platform tested in the pilot program can be adapted to allow more complex congestion pricing strategies that combine the various forms of congestion pricing into comprehensive strategies that have the ability to meet the unique, urban travel needs of metropolitan areas. These more complex congestion pricing strategies would require more computing capacity than the on-vehicle devices deployed for the pilot program.

## How the Oregon Mileage Fee Concept compares with the gas tax

ODOT has determined the Oregon Mileage Fee Concept meets the challenge of a direct comparison to the administrative efficiency of the gas tax collection system.

### ATTRIBUTES OF THE OREGON MILEAGE FEE CONCEPT

**Raises substantial revenue.** From the outset, will provide a dollar-for-dollar replacement of the state fuel taxes that participating motorists would have paid.

**Ease of payment by consumer.** Includes payment with the fuel charge; allows cash or credit payment.

**Ease of collection.** Embeds collection within existing commercial transactions. The largest portion of the mileage fee is pre-paid by gasoline distributors, reimbursed by retailers and, in turn, by consumers. The retailers remit to ODOT only the small differential between the mileage fee owed and the gas tax paid. Retailers selling non-gasoline fuel products would remit to ODOT 100 percent of the mileage fee payment collected from consumers, just as they do now for non-gasoline fuel taxes.

**Easy to administer.** Piggybacking on existing, efficient gas tax collection processes keeps the new system small, efficient and reduces the increased risk inherent in a new revenue collection system. The bulk of the vehicle-related revenue continues to be paid by a small number of taxpayers—the gasoline distributors.

**Low cost of administration.** Using current revenue collection systems to collect mileage fees rather than creating new collection systems minimizes administrative costs. As a result, ODOT estimates that auditing the mileage fee would cost the state approximately $1 million annually.

**Minimal evasion potential.** While ODOT has yet to focus directly on ensuring technological security, the potential for adapting the mileage fee technology to secure manufacturing standards is apparent. Furthermore, most consumers would have little or no incentive to evade this fee.

**Protects privacy.** Places driven cannot be revealed nor are they stored.

**Minimal burden on business.** Retail businesses bear only the burden of additional accounting plus periodic fee remittances and maintenance of the mileage fee collection equipment in their service stations. No changes in task are required of fuel station employees.

**Direct connection to use of highway system.** Directly relates to the burden vehicles place on a state highway system. The mileage fee platform can support any form of congestion pricing that achieves political acceptance.

**No revenue erosion.** The purchasing power of the mileage fee will not erode because of vehicle fuel efficiency improvements, which are expected to accelerate in coming years.[29]

## Field testing the Oregon Mileage Fee Concept

With task force approval, ODOT designed the Road User Fee Pilot Program to test the data and fee collection technology and the administrative feasibility of the Oregon Mileage Fee Concept. The objective was to test, as closely as possible, elements of a system that could actually be implemented statewide. ODOT designed the pilot program, therefore, not as a test of theory but rather as a test of practicability. ODOT also took the opportunity to study any motorist behavioral changes that resulted from increased awareness of mileage-based charges for road use.

29 *It must be noted that both the gas tax and the mileage fee will erode because of inflation. The task force deliberately decided not to design an inflation factor into the Oregon Mileage Fee Concept. ODOT notes that if the mileage fee did contain an inflation factor, it might well be the most reliable road revenue system ever devised.*

## Criteria for evaluation of the Road User Fee Pilot Program

In accordance with statutory requirements, the task force recommended in November 2002 that certain criteria be used to evaluate the pilot program. This list of criteria is contained in Figure 2-1.

## State and federal funding for concept development and pilot program

After completion of an operational test of the technology for the pilot program in May 2004, OSU[30] researchers recommended further development to improve accuracy and ease of use. Accordingly, ODOT applied for and the Federal Highway Administration (FHWA) awarded additional funding under the Value Pricing Pilot Program to field test the technology and administrative features of the Oregon Concept with real motorists fueling at real gas stations. As task force chair, Senator Bruce Starr remarked, the test would allow Oregonians to tell other Oregonians how the Oregon Mileage Fee Concept really worked.

30 *David S. Kim and J. David Porter,* Development and Evaluation of a Complete Technology Configuration Specification for a Vehicle Miles Traveled Based Revenue Collection System, *Oregon State University, July 31, 2007. Available at http://www.oregon.gov/ODOT/HWY/RUFPP/rufff_reports.shtml*

**FIGURE 2-1: ODOT MILEAGE FEE PILOT PROGRAM EVALUATION CRITERIA**

### Pilot Program Evaluation Criteria Adopted by the Oregon Road User Fee Task Force

1. Administration
   - Ease and cost of enforcement
   - Utility
   - Integration with existing systems
2. Cost
   - Start-up costs: capital and retrofitting
   - Operating and maintenance
   - Enforcement and auditing
   - Cost of collection relative to fuel tax
3. Net revenue generation potential
4. Hardware and software
   - Availability
   - Feasibility
   - Accuracy
   - Reliability
   - Security
   - Expandability
   - Interoperability
5. Systemic precision
6. Evasion potential
7. Usefulness for phasing and partial implementation
8. Adaptability to congestion pricing
9. Public acceptance
   - Costs to vehicle owners/operators
   - Ease and convenience to vehicle owners
   - Privacy protection
   - Fairness
   - Transparency
   - Aversion/attraction

CHAPTER 3

# Creating the Field Test for the Oregon Mileage Fee Concept: Staying within the Bounds of Practicality

*This system was designed to be easy for the motorist, who only does one new thing—the motorist pays the new charge in lieu of the gas tax.*

ODOT designed the Oregon Mileage Fee Concept to be simple for motorists. An electronic on-vehicle device identifies geographic zones for allocation of miles driven. Then, when a fueling transaction begins, the stored mileage totals driven in each zone are automatically transferred via wireless communications to the fueling station's point-of-sale system where the mileage fees are applied. The station attendant presents the customer with a receipt for payment that includes both the mileage fee and the fuel purchase price. This system was designed to be easy for the motorist, who only does one new thing—the motorist pays the new charge in lieu of the gas tax.

ODOT and OSU sorted through many options in creating an effective electronic configuration for the Oregon Concept. Some options are naturally better than others and, attributable to several practical constraints, the technology options chosen and/or their implementation for the field test[31] may not ultimately prove the best. This requires more research and development.

Practical constraints notwithstanding, the technology options chosen met two critical requirements. First, the characteristics of the chosen configuration met the conceptual requirements described in Chapter 2. Second, the technology configuration allowed the field test to respect the sensibilities of private participants in the test and stay within the bounds of a small budget, a limited development timeline and legal and contractual constraints.

## Structure of the electronic configuration and technology options

When examining the results of the field test, it is natural to consider why the test was executed as it was, what led to specific technological choices, and why other seemingly more viable options were not used. Much of this can be explained by examining the requirements, constraints, and level of development possible given the time allocated.

Creation of an electronic mileage fee collection system required development since available commercial-off-the-shelf (COTS) technology did not have the required functionality. Development of an electronic mileage fee collection system consisted of both technology development and technology integration into a working prototype or non-commercial system. In other words, the field test tested the Oregon Mileage Fee Concept as well as the general technological concepts employed.

## Functional requirements

In addition to budget, time and other constraints, the structure of the electronic configuration used to test the Oregon Mileage Fee Concept had to satisfy various unique functional requirements. The technology had to include at least the following functions:

**Temporary equipment.** On-vehicle devices and service station equipment must be installed, operated, and removed without permanent modifications to the volunteers' vehicles or service stations' equipment.

**Zone differentiation and mileage counting.** An on-vehicle device must have an ability to collect and differentiate miles driven within pre-established geographic zones, and provide mileage information to motorists.

**Vehicle status identification.** A system must be able to identify vehicles as either a mileage fee payer or a gas tax payer.

31 *The term "field test" is used in this report instead of "pilot program" in order to differentiate the entire program from the active part where participants actually drove with the equipment in their cars and fueled at the two designated fueling stations outfitted with mileage reading equipment.*

**Mileage data transmission.** There must be accurate and reliable transmission of mileage data for mileage fee payers.

**Integrated administrative system.** There must be an administrative system that (1) applies a mileage fee only to miles driven since the last fee paid, (2) may apply different fee rates for mileage driven in different geographic areas and time periods, (3) deducts the gas tax from gas purchases associated with a mileage fee paying vehicle, (4) integrates with the gas tax collection system where gas taxes are pre-paid by gasoline distributors, and (5) retains sufficient data for auditing and resolving consumer challenges of mileage fees paid.

**Integrated receipt.** A receipt for payment must include the mileage fees along with the fuel charge but show deduction of the gas tax.

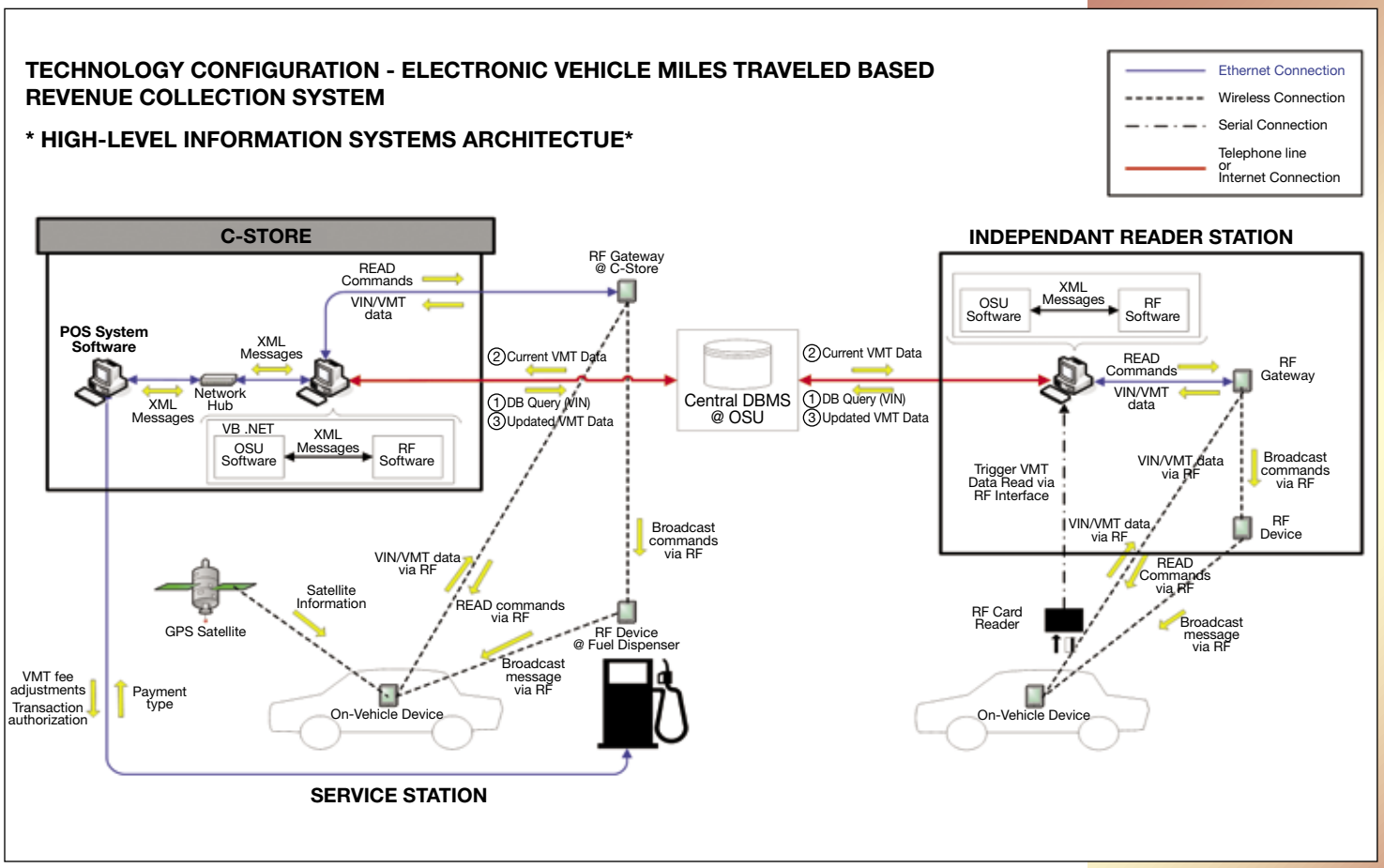
**Transparent system.** A new transaction at the pump must not require any actions on the part of the motorist or service station attendants different than what currently occurs during fueling transactions. The fueling transaction experience from the user perspective should be the same as it is today, except that mileage fees are charged instead of the gas tax.

## Technology configuration overview

Figure 3-1 summarizes in graphic format the technology tested in the pilot program. ODOT installed on-vehicle devices onto 285 vehicles. The devices allocated the miles driven by participant vehicles in various zones over the period of the field test. The on-vehicle devices sent this data to wireless readers installed at the participating service stations using 2.45 GHz radio frequency (RF) communications signals. A wireless gateway provided vehicle to pump associations and mileage data to the

32 *It must be noted that the independent reader portion of Figure 3-1 is not part of the Oregon Mileage Fee Concept and was developed only for purposes of field test administration.*

**FIGURE 3-1: OREGON MILEAGE FEE TECHNOLOGY CONFIGURATION**[32]



station's point-of-sale system (POS). Existing data communications wiring provided fuel volume sales data from the pump to the POS system. The POS system provided this data to a central computer system via commercial Digital Subscriber Line (DSL) technology. The central computer calculated and returned the appropriate mileage fee for that vehicle. The POS then deducted the gas tax from the sale and displayed the mileage fee amount on the customer's receipt along with the gas tax deduction and fuel sales amount.

A GPS receiver allows the on-vehicle device to determine in which pre-defined zone a participant operates the vehicle. Specific point-to-point trip data about the vehicle's whereabouts are not transmitted nor stored on the on-vehicle device or any other external data repository (that is, database). The only information collected is the total number of miles driven by zone. The on-vehicle device allocates the mileage readings from the odometer to the appropriate zone. In basic form, the minimum zones include the area within state boundaries and an out-of-Oregon zone. In the field test, an additional zone outlining metropolitan Portland was also tested.

It should be noted that the technology configuration implemented for this pilot program is not the only configuration under consideration by ODOT and the task force for statewide implementation. In most cases, the results represent the implementation of specific technology for this pilot program and should not be considered a comprehensive test of technology currently available on the marketplace or technology under development for similar purposes. Other alternative technology components and combinations are both possible and worthy of investigation, as noted later in this chapter.

### TECHNOLOGY OPTIONS AND SELECTION

**On-vehicle device.** For statewide implementation, ODOT envisions each vehicle equipped with the necessary on-vehicle technology at the point of manufacture or prior to sale. Since this possibility was not available for a pilot program, ODOT retrofitted participating vehicles with temporary versions of the technology. The on-vehicle device included a dashboard display, a GPS receiver and antenna, a mileage counter unit, and a short-range radio frequency antenna. ODOT wanted to provide immediate mileage and zone information to motorists during the field test. Accordingly, the on-vehicle equipment included a separate display monitor that could attach to the vehicle windshield. The display was economical and could be installed and removed with the use of windshield suction mounts. Mounting onto the dashboard below the windshield was not possible on all vehicles. Nor could tape and adhesives of sufficient strength to ensure permanent fixation be used because they would damage vehicle dashboards. Other approaches, such as integration of a display within the vehicle dashboard—which is ideal—were also unavailable as they would require permanent modifications to a vehicle.

The on-vehicle device required power to operate. Applying separate battery power was not a practical option because of the short duration of the field test. Accordingly, the on-vehicle devices for the field test obtained power directly from the vehicle and did so continuously to maintain accurate mileage collection. More sophisticated power management for the on-vehicle device would have required not only more time and resources than the project budget allowed but also permanent modifications to some participating vehicles.

**Mileage counting.** Odometers currently required for vehicles already count total miles driven fairly accurately as does mileage counting technology that employs GPS receivers. Ideally, ODOT and OSU would have preferred to employ a device in the field test that directly accesses vehicle odometer information, but

that option was not available without permanent vehicle modifications. Accordingly, the two types of on-vehicle devices ODOT and OSU employed in the field test used different methods for counting miles driven. One device employed information from the vehicle itself that is similar to, but not the same as, information generated by the vehicle odometer. This device was called the OBDII device. The second type of device counted mileage using information from the GPS receiver. This device was called the GPS-only device. For lack of direct connection to odometer information, differences in vehicle odometer mileage and on-vehicle device mileage could be observed for both devices.

**Electronic zone differentiation.** The task force's decision to charge mileage fees only for miles driven within Oregon necessitated use of an on-vehicle device that could differentiate pre-established geographic zones. To allow for congestion pricing, the device had to be able to differentiate travel during specific times of day and week. There are several ways to electronically count miles driven[33] but very few practical options allow the electronic creation of zones. Upon the advice of ODOT, OSU recommended using GPS technology for the field test to differentiate geographic zones, days of the week, and time. Another possibility for geographic area differentiation included automatic vehicle identification (AVI) switches at border crossings but numerous disadvantages caused ODOT to cease further investigation of this option. Among these disadvantages include the cost of installing overhead gantries or roadside beacons for reading the AVI devices at every border crossing, the opportunity for vandalism at isolated border crossings and less practicability in facilitating various congestion pricing applications.

Other technology options for zone differentiation should be explored as an alternative to GPS receivers. One such possibility may be use of cellular technology, although the infrastructure required for ubiquitous coverage currently does not exist. Ultimately, GPS technology was used for reasons of accuracy, cost and functionality for intended purposes.

**Vehicle status identification.** The Oregon Concept requires automatic identification of vehicles equipped for mileage-based fees and a determination of the vehicle-to-pump association (that is to say, from which gas pump the vehicle receives fuel) to ensure that:

- The correct participating motorist receives a gas tax deduction and is accordingly charged a mileage-based fee with a fuel purchase.
- Regular customers (in other words, non-participating motorists) do not receive a gas tax deduction with their fuel purchases.

ODOT and OSU considered alternative data transfer concepts but discarded them because they required performance of additional steps by either service station personnel or participating motorists when compared to a current fuel tax related transaction. These options included the use of handheld scanners to read a bar coded vehicle ID number affixed to the participating vehicle, or swipe a card at the pump to initiate a fueling transaction.

The method used in the field test to achieve vehicle-to-pump association relied on the signal strength level of radio frequency signals emitted by devices attached to the fuel pumps. Inherent variability in the manufacturing of these devices coupled with interference sources present at the participating service stations made this method less than ideal.

*The task force's decision to charge mileage fees only for miles driven within Oregon necessitated use of an on-vehicle device that could differentiate pre-established geographic zones.*

33 *One such example, examined by ODOT and the task force in 2002 (called Scenario 4), involves equipping vehicles with an automatic vehicles identification (AVI) device that associates a vehicle with the fuel pump during fueling but also transmits a United States Government fuel efficiency rating. Dividing the gallons of fuel purchased by the fuel efficiency rating would yield an approximation of the mileage driven. The system would apply the fee rate to this approximated mileage to determine the mileage fee. Though likely an efficient and inexpensive alternative to the Oregon Mileage Fee Concept, the task force rejected this approach because it would not allow for the differentiation of zones. See Whitty,* Report to the 72nd Oregon Legislative Assembly, *2003, p. N-4 and footnote 10 of Chapter 9.*

Experimentation with alternative methods was not feasible due to limited time and resources and because of prior contractual obligations with a technology development company.

Since no permanent defacement of vehicles could be allowed and service station equipment could not be permanently altered, some potentially effective alternatives could not be employed to achieve vehicle-to-pump association:

- Installing radio frequency antennas near the fuel inlet of the vehicle and on the fuel nozzle of the pump.
- Embedding radio frequency antennas in the ground near a fuel pump.
- Locating radio frequency readers above each fueling location.

A common feature of the above alternatives is close proximity between the transmitting and receiving antennas, thus minimizing the potential for extreme variability of the radio frequency signal strength. These alternatives and others should be seriously investigated during technology refinement in preparation for statewide implementation.

**Mileage data transmission.** Several practical issues placed limitations on the mileage data transmission technology employable for the field test. High operation costs and the task force's desire for maximum privacy protection eliminated the use of cellular technology for data transmission. Preference for a motorist-friendly and service station-friendly system eliminated card swiping by motorists. ODOT and OSU employed a short-range, widely-used wireless communication technology to transmit mileage data for the field test. While this method is extremely reliable once vehicle-to-pump association is achieved, mileage data transmissions for statewide implementation should favor data transmission technologies that are mature and ensure a high level of interoperability across manufacturers of on-vehicle device technology.

**Data collection and storage.** For the mileage fee to be calculated, mileage between fee payments (fuel purchases) must be captured and stored in a secure, reliable way. There are at least two options for data collection and storage: central storage and on-vehicle storage. The pilot program tested central storage because the Oregon Concept required a minimum amount of data at the time of refueling to establish an audit trail and a mechanism for consumer challenge of the assessment. During the field test, the system collected mileage and fee payment data for each vehicle and stored this data on a central database, managed at OSU. At the time of refueling, the fueling station queried this central database to determine the mileage since the last mileage fee payment, and updated the central computer.

*The GPS Reciever.*

Since ODOT required participants in the field test to refuel at the participating stations only twice per month, refueling at other stations occurred. Therefore, miles accumulated at non-participating fueling stations, for which the mileage fee was not paid as part of the fuel purchase transaction, occurred. These unpaid miles were reported and assessed the next time the participants refueled at a participating station.[34] This emulates statewide implementation, wherein motorists would purchase some fuel out of state, yet still accumulate Oregon miles subject to the mileage fee.

34 *It must be noted that, for the field test, motorists fueling at non-participating stations received a refund for gas taxes paid as part of the participation contract made with ODOT. This particular refund did not occur at the fuel pump.*

The alternative to central storage would be storing all data on the vehicle's on-vehicle device. This would eliminate the risks and costs of communications with the central computer system but would make enforcement more difficult.

**Location detail.** ODOT designed the Oregon Concept to maintain motorists' privacy to the fullest extent practicable. For research purposes, however, more data was collected for the pilot program than envisioned for statewide implementation. The pilot program established four zones—Oregon, non-Oregon, rush hour (in Oregon), and no-signal. In order to do this, the device recorded miles traveled in 31 separate categories, differentiated by geographic zone, day, and time, and then aggregated the data into the four zones. This level of detail exceeds the amount of information necessary for statewide implementation of a mileage fee. The more pricing zones created, however, the more detail is necessary to implement area wide congestion pricing. The system also reports where the motorist purchased fuel within Oregon and how much fuel was purchased.

**Integrated administrative system.** In order to charge motorists mileage fees for miles driven since their last payment, OSU designed the on-vehicle device to only accumulate mileage. The system at the fueling station reads mileage totals in each zone from the on-vehicle device and the central computer computes the appropriate mileage fees by subtracting the prior mileage reading from the current reading. The prior mileage reading is stored in a central database accessible by the mileage fee system. This design has several administrative advantages relevant to the pilot program, including simplifying communications with on-vehicle devices, assisting system enforcement and auditing, and allowing information to be stored for resolution of mileage fee disputes. Information stored on the amount of fuel purchased by motorists paying mileage fees also allows automatic "true-up" between the service station and ODOT of the differences in mileage fees and the gas tax already paid. Among alternatives considered, but not employed, was to have the on-vehicle device maintain trip odometer mileage between payment of mileage fees only, not from fill-up to fill-up. This eliminates the need for a central database, but also prevents the storage of useful and needed information for auditing and fee billing challenges. This alternative would also require writing or resetting of mileage data on the devices, an operation that would require additional wireless communication steps for execution and verification.


Integration of mileage fee payments into the existing gas tax collection system at the service stations requires software changes to existing POS systems and telephonic data exchanges between service station mileage fee systems and a central database. Legal and contractual prohibitions would not allow ODOT access to modify the existing service station POS systems. Therefore, ODOT replaced the POS system of the participating service stations.

Ideally, ODOT would have the legal or contractual authority to require software changes to the service stations' existing POS systems and require accommodation of mileage data systems and communication to a central computer. Otherwise, the best course of action would be to attempt to reach agreement with major oil companies that would eliminate the need for major POS system modifications. If this effort proved successful, it would also eliminate costly and time-consuming certifications on credit card system networks.

**Integrated receipt.** The POS system ODOT employed in the field test allowed the generation of a receipt that added the mileage fee to the fuel bill and subtracted the gas tax. This was an important feature for motorists to see exactly what the system calculated.

**FIGURE 3-2: SAMPLE RECEIPTS WITH MILEAGE (VMT) FEE ANNOTATED**

## Mileage Fee Receipts

### At the Pump

Leathers Fuels
11421 SE Powell Blvd
Portland, OR 97266

06/09/06 12:45 PM
Card: VISA
Batch# 00 Seq # 001
Account# 0007
TESTCARD/TEST
Approval 00000N
Trans# 882317
Unit# 00011661166
T# 091181206
Pump# 1 Unleaded

| | | | |
|---|---|---|---|
| | Gallons | | 19.50 |
| | Price/Gal | $ | 2.549 |
| 1 | ST Fuel Tax | $ | (4.68) |
| 3 | Sale Total | $ | 45.03 |
| | *** ODOT VMT *** | | |
| 2 | VMT Fee | : | 5.12 |
| 4 | Rush Hour | : | 40.0 |
| | In_Oregon | : | 280.6 |
| | Non-Oregon | : | 0 |
| | No Signsl | : | 0 |

Thank You!

1 **"ST Fuel Tax"**
This is a credit for the state gas tax of 24 cents/gallon

2. **"VMT Fee"**
This is the mileage fee calculated for this vehicle. This amount is deducted from this driver's endowment account and not included in the transaction payment.

3. **"Sale Total"**
This is the the total amout that this driver must pay at the pump. The price of gas and all taxes minus the state gas tax.

4. **"Rush Hour/In-Oregon/Non-Oregon/No Signal"**
These are the zones the miles are being counted in. The numbers here represent miles counted since this vehicle's last mileage reading.

### In the Store

csr
R# 1 S# 1 T# 882316 10:55 AM
06/09/06

Leathers Fuels
11421 SE Portland Blvd
Portland, OR 97266

Pump# 1 Unleaded

| | | | | |
|---|---|---|---|---|
| | 19.50 @ 2.549 | | | 49.71 |
| 1 | ST Fuel Tax | | | (4.68) |
| 2 | VMT Fee | : | 5.1224 | |
| 4 | Rush Hour | : | 40 | |
| | In_Oregon | : | 280.6 | |
| | Non-Oregon | : | 0 | |
| | No Signal | : | 0 | |
| | Subtotal | | | 45.03 |
| 3 | Total | | | 45.03 |
| | Cash | | | 45.03 |

Thank You!

CHAPTER 4

# Pilot Program Management

ODOT launched the 12-month Road User Fee Pilot Program in March 2006. The Road User Fee Task Force directed ODOT to test the real world feasibility of the Oregon Mileage Fee Concept.

The pilot program involved 299 volunteer motorists.[35] ODOT's partners in the pilot program included the gasoline service industry and academic institutions. This chapter discusses the development and management of the pilot program, detailing both challenges and successes.

## Funding and grant guidelines

The Federal Highway Administration (FHWA) funded the bulk of the project with three targeted grants through the Value Pricing Pilot Program, totaling $2.1 million for over six years; the State of Oregon contributed $771,000 in matching funds. As a requirement of FHWA funding, Oregon incorporated a congestion pricing component into the pilot program design. As detailed in the preceding chapters, however, Oregon's Mileage Fee Concept addresses issues of stable, fair and reliable funding of highway infrastructure first and handles congestion issues as an option that can be available to the state and to local jurisdictions.

**TABLE 4-1: ROAD USER FEE TASK FORCE AND PILOT PROGRAM BUDGET**

| Budget Summary | | |
|---|---|---|
| Total federal funds | $ | 2,163,949 |
| Total state funds | $ | 771,730 |
| Total project funds | $ | 2,935,679 |
| Pre-implementation, and system development | $ | 744,285 |
| Pilot test implementation plan development | $ | 20,772 |
| Test evaluation planning | $ | 5,000 |
| Task force & ODOT decision making | $ | 326,179 |
| Test preparation: technology | $ | 840,000 |
| Test preparation: participants | $ | 508,877 |
| Pilot test management | $ | 169,699 |
| Education & communication | $ | 50,000 |
| Test evaluation | $ | 235,867 |
| Miscellaneous | $ | 35,000 |
| Total project expenses | $ | 2,935,679 |

## Searching for a field test area with a willing service station partner

ODOT first considered the Eugene, Oregon metropolitan area for the pilot program, a city identified as appropriate for its size and demographics. Given the Oregon Mileage Fee Concept's pay-at-the-pump model, ODOT recognized that strong cooperation with service station owners and operators was paramount. ODOT began meeting with the Oregon Petroleum Association (OPA) in pursuit of the Eugene service station partner(s) needed to implement the program.

The OPA representatives understandably had many questions about the implementation of the pilot program, but worked closely with ODOT to help find a partner for the field test. A local owner of stations affiliated with a major oil company came forward, pending corporate approval. Corporate franchised service stations, however, were not willing to allow ODOT access to their proprietary point-of-sale (POS) systems—access which was necessary to test the pay-at-the-pump concept. POS systems, typically standardized within each gasoline brand, are seen as providing certain competitive advantages (marginal savings on purchase transaction time being of prime importance), and the corporate management of national service station brands proved unwilling to compromise or alter their system or use a different system to accommodate the needs of the pilot program.

These circumstances forced ODOT to reconsider the direction of the pilot program, redirecting focus to independent service stations.

35 *These 299 motorists drove 285 passenger vehicles and made up 221 households. No heavy trucks were included in this pilot program.*

ODOT issued a request for information (RFI) in the Eugene area and directly contacted over 20 independent station owners to solicit their participation. The RFI produced no proposals from local independents. This led ODOT to return to the OPA to discuss alternative partnering possibilities. Given the lack of interest among Eugene area independents, ODOT explored potential service station partners closer to the Portland metropolitan area. The OPA recommended that ODOT contact Lila Leathers-Fitz, CEO of Portland-based Leathers Fuels, who showed interest in participating in the pilot program.

## Project partners

### OREGON STATE UNIVERSITY (OSU)

From a technological perspective, developing, implementing and supporting the devices necessary to the pilot program fell outside ODOT's areas of expertise. Building on previous experience working with OSU's College of Engineering, the pilot program team contracted with OSU to develop technology for the pilot program. In early 2004, OSU began testing the on-vehicle and on-site equipment that would be used in the pilot program. May 14, 2004, proved to be a red letter day when the OSU researchers successfully demonstrated this technology before the Road User Fee Task Force in a public meeting at OSU in Corvallis, Oregon. Task force members and the news media participated in a lab test mileage fee transaction that included driving vehicles equipped with mileage data collection devices. They drove across designated zones and simulated a wireless POS transaction at a mock service station where the mileage and rush hour fees were electronically calculated and a receipt presented. The demonstration proved a mileage fee collected wirelessly at a fueling station could be seamless for customers and technologically feasible.

During autumn 2005, OSU and ODOT conducted a "pre-pilot" study with 20 personal vehicles belonging to state employees, including two state legislators. This program provided a real world test of the on-vehicle and mileage tabulation technology prior to rollout of the field test. Though full integration with service station POS systems could not be tested at this point, the results of the pre-pilot experiment showed that the on-vehicle devices performed as intended.

While OSU's technical expertise covered engineering of the devices themselves, the university required assistance installing on-vehicle devices in modern automobiles. OSU considered several local mobile electronics retailers and installers before settling on Car Toys, a Washington-based retail chain. Car Toys had recently worked on a traffic choices study in the Seattle area[36] installing program-specific hardware, offering key experience in the area.

### PORTLAND STATE UNIVERSITY (PSU)

ODOT had prior experience working with a second area research institution, PSU, on this project. For the pilot program, ODOT contracted with PSU to study changes in driving behavior and document participant responses to the experience. The university conducted three telephone surveys of active participants (at the beginning, mid-point, and end of the field test) and three sets of interviews with staff and management at the participating service stations. Chapter 6 contains a summary of the PSU analysis of results. To read the full report, visit ODOT's Web site.[37]

### LEATHERS FUELS (LEATHERS)

Two gas stations in eastern Portland, owned by Leathers Fuels, participated in the pilot program, allowing ODOT to replace POS systems and install mileage reading equipment. The technology developed by OSU for the pilot program, once installed, allowed service station gasoline pumps to function normally for the station's non-participating customers and apply mileage fees to pilot program participants.

## Recruitment

With partnering relationships established and technological needs satisfied, ODOT's next challenge was to generate enough interest in participating in the pilot program to attract 300 qualified participants with the goal of registering 260. Working with its consultant team, ODOT developed a recruitment plan incorporating print and radio advertising, press releases, and an

36 *An overview of the* Puget Sound Traffic Choices Study *may be found at: http://www.wstc.wa.gov/AgendasMinutes/agendas/2006/Nov14/Nov14_BP2_PSRC_TrafChoicesStudy.pdf.*

37 *Anthony M. Rufolo and Thomas Kimpel,* Road User Fee Pilot Program: Review and Evaluation, *Portland State University, July 31, 2007. Available at http://www.oregon.gov/ODOT/HWY/RUFPP/rufif_reports.shtml.*

informational website. Through a participant recruitment telephone line, the process of soliciting volunteers began in earnest in April 2006. This process included telephone screening to determine qualification followed by an invitation to attend an evening meeting where the sign-ups took place. ODOT was successful in attracting significant interest in the pilot program. The screening criteria, however, limited the ability for many to participate. Through this process, ODOT registered 285 participant vehicles, exceeding its goal by 15 vehicles.[38]

*Jill Pearson of ODOT giving a tour to transportation officials from across the nation.*

## Pilot Program Administration

### COMPENSATION AND INCENTIVES

Participant compensation and incentives were necessary to solicit participation and for smoothing over any difficulties encountered during the year-long pilot program.

ODOT offered participants $300 per vehicle for their full participation in the pilot program. Because the pilot program lasted for an entire year and ODOT needed as many participants as possible to complete the field test, compensation for the pilot program was end-loaded and tied to various milestones.

**TABLE 4-2: PARTICIPANT COMPENSATION SCHEDULE**

| Milestone | Compensation |
|---|---|
| Installation Complete | $50 |
| Beginning Independent Mileage Read #1 | $25 |
| Middle Independent Mileage Read #2 | $25 |
| Final Independent Mileage Read #3 | $25 |
| De-installation and Final Survey Complete | $175 |

As part of ongoing efforts to learn from other national experiments, ODOT pilot staff noted in a similar study significant difficulties during the recruitment phase with volunteers not following up with installation as scheduled. ODOT understood from this how to direct the energy and interest generated during participant registration and training into completed installations. Having a Car Toys representative on site ready to make appointments at training meetings was key to maintaining the installation schedule. To seal the deal, ODOT also offered $40 in "Leathers Bucks" (pre-paid gasoline vouchers, redeemable at the participating service stations) for participants who completed their installation appointments within two weeks of their training. These free gas incentives were extraordinarily successful, with nearly all participants completing their installations early and a 100 percent installation rate for those making an appointment.

Based on the success in generating completed installations, ODOT pilot staff kept a supply of gas vouchers on hand to compensate participants who experienced difficulty with the on-vehicle devices or to encourage participants to attend occasional events related to the pilot program, on an as-needed basis.

### MONTHS ONE THROUGH FIVE: THE CONTROL PHASE

For the first half of the field test, participants purchased fuel at one of the two service stations equipped with mileage readers no less than twice a month. Miles driven by zone were recorded, but participants continued to pay the standard Oregon gas tax. With all participants following the same protocol for the control phase, ODOT established a baseline of driving behavior for each vehicle. Participants developed routines that involved the requisite fuel stops and familiarized themselves with the on-vehicle device. Prior to the initialization of the test phase of the field test, motorists and ODOT also had the opportunity to work through any difficulties with the technology and operations.

**Battery Draining.** While OSU tested the installed on-vehicle devices prior to the start of

38 *See Appendices G-H for details.*

the field test in the pre-pilot study mentioned above, no one had driven with the devices installed for an extensive length of time. In the first few months, ODOT began to receive complaints from some participants about batteries draining unexpectedly. Electrical current draw from the on-vehicle device, especially when vehicles were not operated for several days in a row, was enough to drain older batteries and require replacement in certain makes and models. Once the problem was diagnosed, ODOT responded with a program-wide bulletin detailing the problem, offering the temporary cautionary solution of unplugging the on-vehicle device if a vehicle would be unused for several days, and replacing the spent batteries.

**Physical Distance Challenges.** When issues like battery drains or other minor technical glitches arose, the physical distance between the field test area (Portland) and the engineering labs at OSU (Corvallis) proved problematic. Typically, a participant would contact ODOT in response to a technical issue and ODOT would then forward that information to the Engineering Department at OSU. Equipment malfunctions were handled two different ways. Generally, OSU researchers would travel 160 miles round trip to make repairs to the on-vehicle devices. Alternatively, for routine repairs, OSU shipped replacement devices to participants with instructions on how to replace them. OSU followed up via phone to assist participants with the procedure. This process, though necessary in a research test, led to minor dissatisfaction among some participants and left a few participant vehicles out of the field test for weeks at a time.[39]

*Betsy Imholt of ODOT giving a tour to tranportation officials from Minnesota and Seattle.*

### MONTHS SIX THROUGH TEN: THE TEST PHASE

During the second half of the field test, known as the test phase or experimental phase, the participants were divided into three different groups. There was a small control group—about ten percent—which collected miles while continuing to pay the gas tax. The remaining participants were divided into either the vehicle mile tax (VMT) group or the rush hour group. Depending on the group assigned, additional incentives or compensation could be earned by reducing the amount of driving in comparison with the baseline. Prior to dividing participants into groups, ODOT conducted a focus group with six of the participants asking them to review and comment on instructional materials. Focus group members gave feedback and asked questions after reading through these materials on expectations for the second phase of the field test. The group discussed clarifications to make the materials understandable to all participants. This discussion provided valuable insight into potential confusion about some of the pilot program requirements, and likely averted potential difficulties.

At the midpoint, motorists in the VMT group ceased paying the gas tax, and their receipts for gas purchases now detailed a mileage fee of 1.2 cents per mile and subtraction of the gas tax (24 cents per gallon). Participants in the rush hour group also discontinued paying the gas tax, but their purchase receipts now detailed the rush hour fee of 10 cents per mile wherein motorists paid the higher rate per mile for driving during "rush hours" (7-9 AM and 4-6 PM Monday through Friday, excluding holidays) within the Portland metropolitan area.[40]

No participating motorists actually "paid" the mileage fee or rush hour fee at the pump during the field test, regardless of group. Instead, ODOT charged the mileage fee or rush hour fee to an endowment account. ODOT used the mileage and zone data collected

39 *While neither ODOT nor OSU had the staff or budget available to do so, in hindsight, establishing a field station for repair and maintenance issues at ODOT's Portland office may have minimized these problems.*

40 *The VMT rate for non-rush hour miles was reduced to .43 cents per mile for the rush hour group.*

during the control phase to determine fees that would be generated per vehicle, and debited them against the endowment fund established for each vehicle. ODOT established individual endowment accounts to pay the fees predicted for the participants in the test phase based on each vehicle's driving patterns during the control phase. Unbeknownst to the participants, ODOT calculated the predicted fees based on the total number of miles driven during the first half of the field test. ODOT's thinking was that if the participant's driving patterns remained the same throughout the test phase as they were in the control phase, their endowment account balance would equal zero at the conclusion of the field test. ODOT notified participants of their endowment balances every few weeks, giving them information that could help them modify their driving habits in order to reduce the mileage fee charged to their account balance and maximize their reward at the completion of the pilot program. Any endowment balance remaining at the end was granted to the participant, thus providing an economic incentive that was intended to mimic real-life incentives to save money by driving more consciously.

Participants in the two experimental groups also had the option to submit receipts for gasoline purchased at non-participating service stations and have the gas tax refunded to them twice during the second half of the field test (January and March 2007).

### FIELD TEST WRAP UP

At the pilot program's conclusion, ODOT held a pizza party to thank those participants who completed the field test. A raffle was held to encourage attendance and participation. Approximately one-fifth of the final 260 participants attended, giving both ODOT and motorists a chance to discuss one-on-one the successes and difficulties of the pilot program. This proved valuable to both ODOT and the participants because of the opportunity to receive immediate feedback to questions on both sides. Pilot program managers got a sense of what the group thought as a whole and could see and hear the subtle tone of likes and dislikes. Also, participants talked with each other and compared experiences. Although unofficial, recurring comments included participants changing their driving behavior due to having the mileage display in their vehicle. One person commented that she began walking to neighborhood places when she realized by looking at the display how short the distance from her home actually was. Other people said they began organizing short trips from home to consolidate to one trip. Many who attended said they were sad that the pilot program ended and felt invested in the program.

### COMMUNICATIONS

**Participant communications.** Given the length and nuances of the pilot program, ODOT designed a comprehensive communications plan[41] to ensure that participants were fully informed of pilot program parameters and responsibilities and to establish that ODOT could address potential problems. At the initial training meetings, ODOT asked participants to specify their preferred method of communication, usually telephone or email. While certain communications necessitated a particular approach, ODOT used the participants' preferred means of communication for the various reminders, newsletters and notices.

**Internal communications.** Internal communications fell into four main areas: participant and accounting databases maintained by ODOT, a mileage-by-zone database maintained by OSU, and a participant database maintained by PSU. The ODOT database tracked the status of milestone payments, technological problems, and communications. ODOT's accounting database detailed credits and debits to participant endowment accounts. The OSU database tabulated all data transmitted from participant vehicles at the pump. PSU's database recorded behavioral statistics. Each of these databases arose separately to fill a need, but this lack of integration proved problematic. Something as simple as a change of address would require updating four times, and, if communication between the ODOT project office, accounting office, PSU, and OSU disconnected, the change may not have made it into the relevant database at all. Operationally, a unified, web-based system that could be accessed by all relevant ODOT, PSU and OSU staff would have alleviated these issues.

41 *See Appendix H for pilot program communications plan.*

CHAPTER 5

# Evaluation of the Pilot Program as a Demonstration of the Oregon Mileage Fee Concept

This chapter assesses and discusses the administrative and technological processes developed for the Road User Fee Pilot Program. ODOT and Oregon State University chose technologies that would test, as closely as practicable, the administrative and technological systems envisioned for statewide implementation of mileage fee collection at the fuel pump. Attributable to the impermanent nature of the field test, ODOT had to employ temporary technology applications that approximate ultimate systems that would be employed in statewide implementation. These choices are fully described in Chapter 3. This chapter examines the extent to which the pilot program results validate the Oregon Mileage Fee Concept in accordance with the evaluation criteria established by the Road User Fee Task Force described in Chapter 2, Figure 2-1.

*ODOT Director Matt Garrett, OSU professors Dr. David Porter and Dr. David Kim explaining the technology to US Transportation Secretary Mary Peters.*

## Evaluation criteria 1: Administration

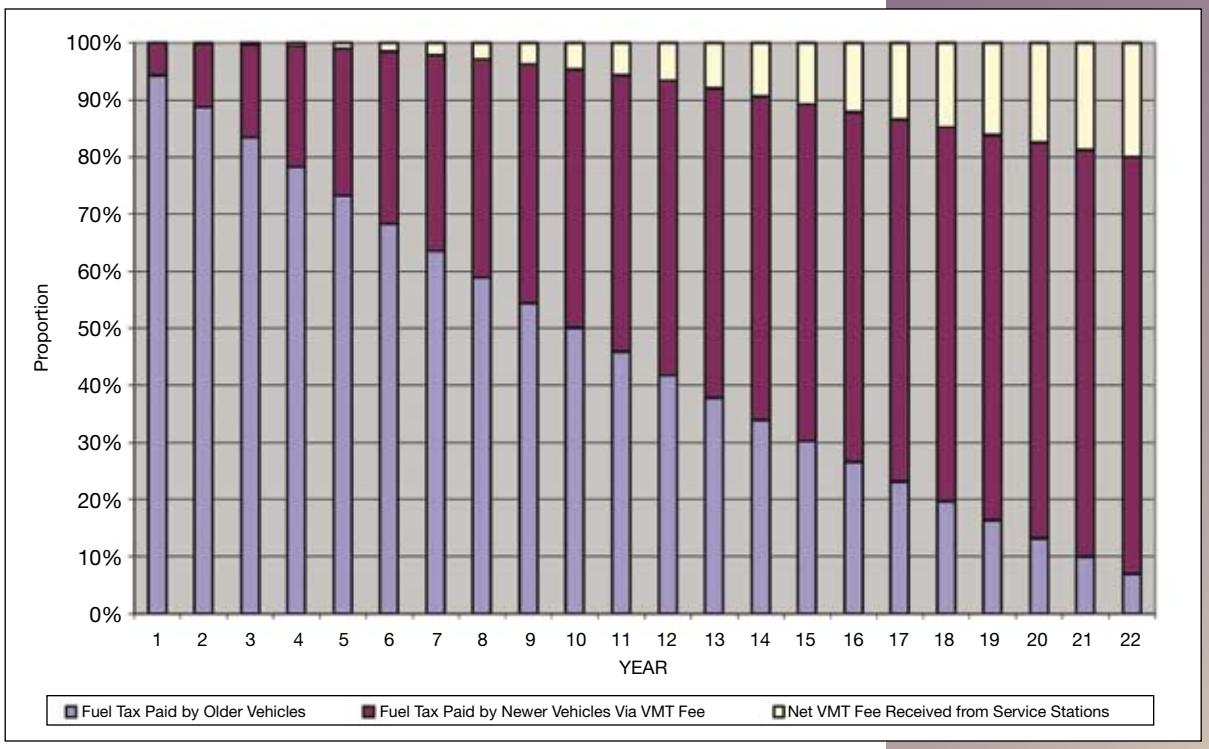
### EASE AND COST OF ENFORCEMENT

**Assessment.** The pilot program demonstrated that the Oregon Concept provides a cost effective and useful deterrent against fee evasion. This is due in part to the system's purposeful reliance on the current gas tax collection process whereby the gasoline distributors pre-pay the bulk of the mileage fee through the gas tax, thus minimizing collection risk to the state. Targeted auditing capabilities are an effective tool to thwart evasion. Additionally, if the on-vehicle device fails to transmit any data, the motorist would pay the gas tax. Nevertheless, more research and development must occur to ensure the on-vehicle devices are tamper proof.

**Discussion.** To recap, gas tax collection occurs at the first point of wholesale distribution into the state by approximately 150 distributors who are reimbursed by the retail stations and, in turn, by the motorists when they refuel. Under the Oregon Concept, mileage fees are obligated at the consumer level. Therefore, the mileage fee requires enforcement at three levels: the distributor level, the station level and the consumer level.

At the distributor level, there is no change from current practices for payment of the state gas tax. Distributors will continue to remit the default payment of 24-cents per gallon of gas to ODOT at the point of distribution into Oregon. Furthermore, the distributor will also prepay the bulk of the state mileage fee in the form of the gas tax as a mileage fee surrogate. Because of this, ODOT estimates that even 22 years after the mileage fee begins implementation, when nearly all Oregon vehicles contain equipment to pay the mileage fee at the pump, ODOT will still collect roughly 80 percent of all revenue from distributors paying the initial estimated fees based on the 24-cent gas tax. This is illustrated in Figure 5-1.

**FIGURE 5-1: ESTIMATE OF MILEAGE FEE REVENUE SHARES OVER TIME**




Upon statewide implementation, an ever increasing percentage of mileage fee revenues will be paid by stations during the monthly true-up process. At the station level, the mileage fee introduces new potential for risk. Unlike distributors, fueling stations operate on low profit margins, increasing the incentive for underpayment. Furthermore, there is a much greater number of stations than distributors (1,800 vs. 150) thus increasing the likelihood of collection issues. One or more of these 1,800 stations go out of business or change ownership each year, potentially complicating payment recovery. Prepaying the bulk of the mileage fee—prepaid through use of the distributors' gas tax payments as a surrogate for mileage fee payment—minimizes the greater risk of payment at the retail level. Moreover, the amount of exposure to somewhat greater risk at the retail level would be extremely low during the early years of mileage fee payment because of the long phase-in. The long phase-in also allows sufficient time for improvement of administrative systems before the percentage of retail payment reaches substantial levels.

On the other side of the equation, the opportunities for evasion are low at the retail station level. Since point-of-sale (POS) systems closely track fuel sales, evasion would require tampering with some key piece of technology—either the POS system, the pump, or data transmission equipment—all fairly easy to detect. For chain stores, which make up the bulk of the 1800 stations, POS systems are typically corporate-issue, controlled closely by a central office. Any tampering with those systems would presumably be consistent across the entire chain, which would be fairly easy to spot in a routine database audit. Similarly, the Oregon Department of Agriculture inspects pumps regularly to assure fuel delivery is measured accurately.

On the consumer side, evasion can take two forms:

- Purchasing fuel from non-taxed sources.
- Tampering with equipment.

Only diesel fuel vehicle owners have the opportunity to purchase fuel from non-taxed sources, because Oregon taxes all gasoline at the full rate. Non-gas supply chains sell untaxed diesel not intended for road use. For this and other reasons, occurrences of tax evasion in the diesel market are more common than in the gasoline market. The mileage fee should in no way exacerbate this problem. More likely, the mileage fee collection system could actually help guard against such evasion and recoup revenues when the vehicle next refuels at a standard service station as the vehicle would then be assessed mileage fees since it last refueled.

In any event, the incentive to evade would be very low for most motorists. First, mileage fees are low. A typical motorist pays $3 to $4 per tank in state gas taxes. The mileage fee would

*Overall, enforcement and administration of the mileage fee would not be substantially more difficult or expensive than the current gas tax.*


be a fairly similar amount (at 1.2 cents per mile) for all except extreme cases at either end of the spectrum, and even then it would generally not exceed $6 per fill-up for a highly fuel-efficient vehicle. Consequently, the marginal difference between paying the gas tax and paying the mileage fee—and therefore, the incentive to evade the mileage fee—is very small. Second, the driver would have to pay the gas tax if he or she evaded the mileage fee by blocking the signal identifying the vehicle. The driver would save only the amount of the miniscule difference between the mileage fee and the gas tax. Third, in the case of device tampering, the risk of harming the built-in equipment in unforeseen ways should outweigh the minor dollar gains of successful tampering. Fourth, ODOT could detect device tampering by inspection when ODOT auditors identify anomalies in mileage fee transaction data between fuel amounts purchased and miles driven for a vehicle with a certain fuel efficiency rating. Fifth, civil and, perhaps criminal penalties could be set to deter most device tampering. Finally, motorists of the fleet with average or lower miles per-gallon may have an incentive not to evade the basic per-mile charge, depending on the flatness of the rate structure.

Overall, enforcement and administration of the mileage fee would not be substantially more difficult or expensive than the current gas tax. Principal factors for this are:

- Piggybacking on existing systems. Since the overwhelming bulk of the mileage fee revenue will be collected by methods already embedded with effective enforcement mechanisms, the state's overall exposure to increased evasion is very low.
- Incentives to evade are low. Most of the revenue will continue to come from distributors with whom the state already has well established mechanisms for collection and enforcement. Fueling stations and motorists represent new evasion opportunities in the revenue stream but the likelihood of successful evasion at the station level would be fairly low with even a modest amount of audit and enforcement activity. It should be recognized, however, that while the incentive to evade the basic mileage fee is quite low, the incentive for motorists to evade higher congestion pricing fees, will be much greater.
- Central database. Storing mileage fee payment data and gas purchase data in a central database sorted by vehicle ID gives the state an effective audit capability to identify potential evasion,[42] as well as potential problems with on-vehicle and service station devices. Automated reports could detect anomalies and trigger follow-up. The alternative—storage of all data on the on-vehicle device—introduces a greater risk of motorists tampering with the device, although the incentive to do this is low and the risk of damage to the on-vehicle computer would be high. This would, however, enable complete protection of motoring data and thus alleviate all privacy concerns. On the other hand, encryption could also help alleviate privacy and tampering concerns. While ODOT may prefer the central database approach to protect auditing abilities, the question of whether to go in the opposite direction and proceed with on-vehicle storage is open and it will likely not reach resolution until the state legislature adopts policies on the privacy issue.[43]

Regardless of the method used for auditing and detecting evasion, questions remain for further analysis, including:

- How should malfunctions of either on-vehicle devices or fueling station equipment that cause reporting gaps be addressed?

42 *If a hacker figured out how to cause the equipment, for example, to read a very low, fixed mileage fee every time the vehicle refueled (thus evading the gas tax and most of the mileage fee), the fuel purchase data retained by ODOT could be used to identify an anomaly that could prompt an investigation and audit.*

43 *ODOT will remain apprised of the developing trends—both technical and institutional—to protect privacy and will incorporate the most effective methods into the Oregon Mileage Fee Concept as they are identified as feasible.*

- What should be the threshold at which various discrepancies trigger a response?
- How should discrepancies be handled?
- What should the process be for gaining legally enforceable deficiency recoveries of unpaid mileage fees?
- What is the best way to secure the on-vehicle device against tampering?

### UTILITY

**Assessment.** The pilot program successfully demonstrated the utility—or usefulness—of the Oregon Concept for collecting mileage fees as a replacement to the gas tax.

**Discussion.** In selecting the utility criterion, the task force meant, "Does it work?" Essentially, the task force asked, "Can the Oregon Concept be feasibly implemented administratively?" Furthermore, "Did the technology and administrative systems work sufficiently well as tested?"

The answer to the first question of feasibility is a resounding, "yes."

- The mileage fee system properly calculated mileage fees at the retail level.
- The mileage fee system accurately completed financial transactions between the customer and service station, and between the service station and ODOT.
- While there were some technical glitches, nearly all were pilot-specific due to processes or technologies implemented in the field test not envisioned for use during implementation.

With regard to the second question, the vehicle identification, GPS zone delineation, mileage counting and storage, data tracing, and communications technology performed as intended.

*Jim Whitty of ODOT welcoming a Seattle transportation official to one of the pilot program gas stations.*

### INTEGRATION WITH EXISTING SYSTEMS

**Assessment.** The pilot program successfully demonstrated that the mileage fee can be implemented alongside and integrated with the gas tax collection system. Specifically the mileage fee collection can be integrated with current service station operations, including POS systems, and processes for remitting tax payment to the state. Nevertheless, further software development is necessary to allow for fixed price cash transactions.

**Discussion.** One of the key administrative elements of the mileage fee's viability, as envisioned in the Oregon Concept, requires integration with existing systems. ODOT envisions phasing in the mileage fee with most motorists continuing to pay the gas tax in the early years. Only vehicles equipped with the appropriate technology installed prior to first sale (or prior to first registration for certain vehicles brought into the state by new residents) would pay the mileage fee. As the number of appropriately equipped vehicles increases, the state would gradually transition to a predominantly mileage fee-based system. Thus, it would be necessary for the mileage fee collection system to coexist with the gas tax collections for approximately 20 years until the fleet of vehicles on the road equipped with the necessary technology approaches 100 percent.[44] At that point, the gas tax could be retained as a redundant system for the mileage fee to facilitate disincentives for tampering,[45] provide a revenue system for out-of-state motorists and provide a safety net for technology disruptions.

The electronic mileage fee collection system, as designed for the pilot program, integrates with two main existing systems: service station operations and tax collection from fuel distributors to the state. Integration with service station operations centers on adaptation of the POS system to levy either the gas tax or the mileage fee, depending on the vehicle. For the pilot program, OSU engineers modified and installed an off-the-shelf POS system at both stations as a requirement for participation in the program. ODOT does not

44 *At some point prior to the 100 percent turnover of the statewide fleet, the state may want to engage in a small amount of retrofitting of the remaining older vehicles with the appropriate technology. There may be numerous reasons to do this, including enablement of flexible congestion pricing strategies in urban areas.*

45 *Raising the gas tax may be a realistic strategy at this point since most residents would not pay the gas tax.*

*Since the task force does not currently envision retrofitting vehicles with the necessary mileage fee equipment, only newer vehicles, tending towards greater fuel efficiency, will be equipped to pay mileage fees, particularly during the early years of statewide implementation.*

envision mandating a particular POS system for statewide implementation. Rather, ODOT would require that POS systems meet certain specifications. Service stations could then retain their proprietary POS systems. There are many different POS software systems in use by service stations, each of which will require custom modifications to integrate with the Oregon mileage fee collection system.

Once the mileage fee is collected at the pump, a process begins to determine the total amount of mileage fee collections the station owes the state. A characteristic unique to the Oregon Concept, this process maintains the current system for the gas tax collection but modifies it to account for mileage fees that may differ from gas tax collections at the retail level.

Recall that about 150 wholesale distributors remit the gas tax to the state at the first point of wholesale distribution in Oregon. As such, all gas arrives "tax-paid" at Oregon retail stations because the stations pay the wholesalers the tax on gallons delivered. Retailers in turn pass the tax to their customers at the time of retail sale. Under the Oregon Concept, distributors will continue to remit gas taxes to the state as before, and retailers will continue to remit gas taxes to wholesalers on all gallons delivered. For retail sales to mileage fee paying vehicles, there may be a small difference between the amount of gas tax paid by retailers to their wholesale supplier and the mileage tax collected from the retail customers, depending on the fuel efficiency of the mileage fee vehicles. The cumulative difference will be the subject of a weekly or monthly true-up between the state and the retailer, so that the state collects no more or less than the mileage fee charged to vehicles, and to ensure the retail station is made whole in terms of gas tax paid to wholesalers vis-à-vis the gas tax and mileage fees collected from their customers. ODOT intends this true-up process to be accomplished electronically using the same technology that allows the mileage fee calculation to occur between the state and the retailer.

Should the wholesaler own the retail station, the wholesaler still pays gas tax to Oregon on gallons delivered to the stations, not on station sales. For retail stations owned by wholesale distributors who pay gas tax to the state, this true-up would be unnecessary. Instead, the wholesalers merely add or subtract the gas tax and mileage fee difference cited above for their own retail stations on their monthly gas tax returns to the state, which are filed and paid in the month following delivery to the retail stations.[46] This was the process used in the pilot program. ODOT found it simple to complete this reconciliation.

The process is somewhat different for diesel fuels. Heavy trucks consume most of the diesel fuel burned on Oregon highways but pay state weight-distance taxes in lieu of a per-gallon fuels tax. As such, mileage fees under the Oregon Concept would not be charged to heavy trucks, since such fees are already charged in Oregon according to miles adjusted by weight. The non-road industrial users of diesel pay no tax. Only light diesel-engine vehicles (under 26,000 pounds) pay a diesel fuel tax at the pump. Attributable to the small light vehicle diesel market, fueling stations pay diesel fuel taxes directly to ODOT. Thus, fueling stations would pay the full amount of mileage fees to ODOT for diesel fuel sales to light vehicles because distributors do not pre-pay the fuel tax on diesel. Since the amount of diesel fuel subject to fuel tax is relatively small, the risk of loss due to retail-sourced evasion is also relatively low.

The likelihood is low that individual fueling stations will collect less in total mileage fees than in total fuel taxes.[47] Since the task force does not currently envision retrofitting vehicles with the necessary mileage fee equipment, only newer vehicles, tending towards greater fuel efficiency, will be equipped to pay mileage fees, particularly during the early years of statewide implementation. In most cases, mileage fees

46 *Under Oregon law, off-road vehicles can apply for reimbursement of the amount of the fuel price paid that relates to gas tax paid. Should Oregon proceed to adoption of a mileage fee collection system, a similar system allowing reimbursement for off-road travel could be adopted.*

47 *This assumes a flat mileage fee rate comparable to the 24-cent state gas tax burden for a vehicle with average fuel efficiency.*

paid by such vehicles will be at least as high as the gas tax that would have been paid.

One problem that did arise with service station operations occurred when participants wanted to pay a fixed amount with cash. Gas transactions automatically include the gas tax as part of the retail sale. Mileage fee transactions require the POS system to back out gas taxes and add in the mileage fee. Typically this caused a small net difference in the total sale as reflected on the receipt. For credit card transactions, the mileage fee transaction was the same as for a gas tax transaction. For cash-paying customers requesting a fixed dollar amount of fuel, however, the transaction was more complicated. Because the mileage fee was added to the transaction while the fuel was pumping, there was no way for the customer to spend a fixed amount. For example, if the customer asked for five dollars worth of gasoline they would expect to pay exactly five dollars for the transaction. After the transaction was complete, the receipt would show the total fuel purchase, the state gas tax deduction and the total mileage fee amount. Since, during the field test, the participants did not actually pay the mileage fee at the point-of-sale, the attendant always owed the participant change, due from the gas tax refund. In a real world transaction, the driver would likely owe the station more than five dollars if the mileage fees were more than the gas tax refund or the station would owe the driver if the mileage fees were lower than the gas tax refund, thus making it difficult for a driver to spend a fixed amount.

## Evaluation criteria 2: Cost

### START-UP COSTS: CAPITAL AND RETROFITTING

**Assessment.** The pilot program provides no additional data on start-up costs beyond ODOT's previous 2003 estimates. Nevertheless, ODOT learned some valuable lessons that may help refine cost estimates as research continues.

**Discussion.** In 2003, ODOT estimated the cost of implementation at roughly $33 million for initial setup and other capital costs. Table 5-1 outlines these cost estimates.[48]

Development costs for the prototype on-vehicle device used in the pilot program totaled $209 per unit, while manufacturing costs were $338 each. Installation of the devices cost $55 per unit. The development costs for the prototype station devices were $186 each and manufacturing cost $286 apiece.[49] ODOT expects that in full production for a statewide implementation, the cost per unit would be much lower than the cost of the prototype units used in the pilot program. With technology development, the per-unit cost for prototypes is always much more expensive than full production manufacture. Furthermore, in the pilot program, the original company contracted to produce the equipment was unable to deliver on the product, and a new firm had to be hired to complete the development and manufacture under a tight deadline. This switch in manufacturers increased costs more than expected. ODOT concludes that for statewide implementation, a mass produced device would result in far lower cost per unit. Indeed, some suggest that the cost of GPS chips at the core of the device could fall to well under $100 within a few years.[50]

**TABLE 5-1: ESTIMATED START UP COSTS OF MILEAGE FEE**

| | |
|---|---|
| **Data Transfer:** | |
| Equipment | $3,874,000 |
| Software | $2,250,000 |
| Installation | $10,800,000 |
| **Other Service Station Infrastructure:** | |
| Point-of-Sale System Improvements | $9,171,000 |
| Dedicated Telephone Lines | $236,000 |
| **Contingencies** | $5,270,000 |
| **Total Service Station Capital Costs** | $31,601,000 |
| **State System Capital Costs, Including Contingencies** | $1,200,000 |
| **Total Capital Costs** | **$32,801,000** |

Prior to the field test, ODOT determined the fuel pump system used at one of the participating fueling stations was incompatible with the requirements of the pilot program because the pumps could not accept credit cards. ODOT incurred a $78,000 cost for replacing these pumps. ODOT would not require replacement pumps in statewide implementation. Rather,

48 *These estimates are based on the following assumptions: 1,800 service stations, 2,800 fuel pumps (as of 2002), no pump upgrades, and a central database.*

49 *If the cost of these service station prototypes were directly translatable to mass produced devices, this would increase initial capital costs by approximately $300,000, based on 1,800 service stations.*

50 *Max Glaskin,* Out Of This World: The Space-Age Route to Road User Charging, Traffic Technology International, *August/September 2007, p. 19.*

*ODOT developed the Oregon Mileage Fee Concept closer to the privacy end of the spectrum.*

ODOT would issue POS system requirements with which stations would have to comply. The station then could determine how to best meet these requirements. The state legislature in law, and ODOT in rulemaking, would decide how much of these costs would be absorbed by the stations and how much would be paid by ODOT.

### OPERATING AND MAINTENANCE

**Assessment.** In 2003, ODOT estimated annual operational costs to administer the mileage fee at approximately $1.6 million.[51] The scope of the pilot program did not include cost validation of ODOT operations.

**Discussion.** The total annual operating cost represents a small fraction of revenue collected. Recall from Figure 5-1 that ODOT estimates that 20 years after statewide implementation one-sixth of total user-based revenue will be collected at the fuel pump via the mileage fee. Current state gas tax revenue totals about $400 million per year. Thus, after 20 years, the portion of the mileage fee actually collected at the fuel pump would take in about $67 million (in today's dollars).

ODOT operation costs may prove somewhat higher than originally anticipated during concept development because of the potential for greater database management functions. For the pilot program, ODOT set up ad hoc, manually managed databases for mileage counting, reconciliation, and participant management. While not all of these databases would be required for statewide implementation, ODOT does envision use of integrated electronic database systems.

**TABLE 5-2: ESTIMATED COST OF MILEAGE FEE OPERATION**

| | |
|---|---|
| **Operating Costs** | |
| Auditing, enforcement, and administration | $ 1,000,000 |
| Communications lines | $ 600,000 |
| **Total Annual Operating Costs** | **$1,600,000** |

### ENFORCEMENT AND AUDITING

**Assessment.** The 2003 estimate of $1.6 million in annual operating costs[52] listed in Table 5-2 includes auditing and enforcement. These costs represent less than three percent of total mileage fee revenue collected at the pump.

**Discussion.** Enforcement and auditing costs depend upon the amount of data maintained and available for auditing and enforcement. In the pilot program configuration, some data was maintained for these purposes. If a legislatively adopted policy required maximum protection of privacy, then little or no data could be retained thereby reducing costs for auditing activities, proactive enforcement measures, and customer inquiries. This could increase incidents of tax evasion with no ability to recover lost revenue and likely lower levels of mileage fee collections. As such, the legislature may be forced to increase the mileage fee rate to compensate for a higher level of unrecoverable fees.

The privacy/audit-ability issue can be expressed as a continuum.[53] When a system completely protects privacy, the ability of an agency to audit payments, and the ability of a customer to challenge a bill, becomes difficult. On the other side of the continuum, when privacy is completely surrendered, audit-ability and therefore enforcement and the ability for a customer to challenge a bill, is easily attained. ODOT developed the Oregon Mileage Fee Concept closer to the privacy end of the spectrum.

### COST OF COLLECTION RELATIVE TO FUEL TAX

**Assessment.** The cost of collecting the mileage fee compared favorably to the fuel tax because the bulk of the collection system remains the same with ODOT collecting the fee from the distributor. The remaining mileage fee differential collected at the service stations would involve the addition of a fairly inexpensive automated transaction recording and true-up system.

**Discussion.** ODOT currently collects the revenue generated by the gas tax from distributors, as described in Chapter 2. ODOT envisions that this process will continue with implementation of a mileage fee, but mileage fee collection at the fuel pump will also require monthly (or weekly) true-up transactions between ODOT and about 1,800 service stations.

51 *This $1.6 million for auditing breaks down into $1 million for annual state auditing costs with the remaining $600,000 a private sector communications cost estimate. See Table 5-2.*

52 *Estimate is in current dollar costs and is subject to future inflation and possible technological efficiencies.*

53 *See Appendix I for a visual representation of the privacy continuum.*

One might expect a large increase in the administrative burden to the gasoline distribution industry for collection of the mileage fee, but this should not occur because of the automated transaction recording and true-up system developed for the mileage fee collection.[54] As demonstrated in the pilot program, this automated system greatly minimizes the administrative burden to the state and the service stations. Furthermore, retail fueling stations already pay diesel taxes in Oregon. Thus, many stations already conduct monthly fuels tax transactions with ODOT. The mileage fee, therefore, introduces only an incremental increase in the number of transactions—from stations that do not sell diesel—not an entirely new type of transaction or process. For these reasons, the added cost of mileage fee collection should be minor. In addition, the mileage fee infrastructure between ODOT and the retail stations should enable more efficient completion of electronic accounting, auditing, and true-up transactions, offsetting additional mileage fee transaction overhead.

## Evaluation criteria 3: Net revenue generation potential

**Assessment.** As demonstrated in the pilot program, the Oregon Concept has extensive ability for generation of revenue depending upon the rate structure established by the legislature.

**Discussion.** By designating this criterion, the task force essentially asked, "Will the mileage fee system raise sufficient revenue, net of setup and operating expenses?" If the mileage fee was set at a level roughly equivalent to the current gas tax on a fleet average miles-per-gallon basis, the pilot program showed a mileage fee implemented statewide would be roughly revenue-neutral at the outset. In other words, at 1.2 cents per mile traveled, an average vehicle would pay the same amount in mileage fees as it would in gas taxes, and the administrative systems would capture, assess, and collect the appropriate amount of the fee. After the initial start-up period, however, the mileage fee implemented statewide would begin to generate more revenues than what the gas tax would be expected to generate since the gas tax erodes because of improvements in vehicle fuel efficiency, while the mileage fee does not. For this reason, the mileage fee acts as a stop-loss on the erosion of road revenues for reasons of vehicle fleet fuel efficiency improvements.

## Evaluation criteria 4: Hardware and software

### AVAILABILITY

**Assessment.** Hardware and software technology meeting task force criteria was not available for purchase off the shelf. As a result, ODOT had to have equipment custom made for the pilot program.

**Discussion.** As mentioned earlier, the creation of an electronic mileage fee collection system required development since available commercial-off-the-shelf (COTS) technology did not have the required functionality. On-

54 *See description of VMTCAR in Chapter 2.*

vehicle device technology existed that could collect mileage via the vehicle's OBDII port or through GPS but lacked the radio frequency (RF) transmission capabilities that facilitated a seamless integration with participating service stations. Therefore, these and other features had to be developed and integrated into a single device. Additionally, several hardware and software components were needed to allow the POS system at the service stations to integrate the mileage fee into the customer's receipt.

It is reasonable to expect that in the near future, better (this is, faster, more reliable and cheaper) technology would be available to support a mileage-fee based system. Developing a set of requirements to which existing POS systems have to comply would also be a paramount step in ensuring an easy transition into such a system.

### FEASIBILITY

**Assessment.** The mileage fee collection system operated successfully during the field test and proved feasible.

**Discussion.** Overall, the mileage fee collection system operated as required during the test period. The system developed for the pilot program successfully managed transactions from equipped fuel pumps and vehicles. There were a total of 18 days—or 3 percent—lost between the two stations where the mileage fee transactions could not be calculated due to a variety of component failures including: problems with POS system (4), lost power (4), cable or equipment accidentally disconnected (2), unknown (1), DSL communications problem (1) and OSU web-server down time (1). Not all of these failures caused lost service station operations.

**TABLE 5-3: VOLUNTEER PARTICIPANT TRANSACTION DATA FOR THE PILOT PROGRAM TEST PERIOD**

| Description | Number of Transactions |
|---|---|
| Total for the field test | 3,811 |
| Total for the second phase | 1,685 |
| Total with a mileage fee assessed | 1,540 |

The number of mileage fee transactions shown in Table 5-3 constitutes a tiny fraction—2.3 percent—of the total number of transactions (72,029) generated at the two participating service stations during the test phase. This shows the pilot program is ideally designed to accommodate both vehicles equipped with on-vehicle devices for mileage fee assessment, and non-equipped vehicles. This is a relevant feature if a mileage based system were to be phased in over time by only equipping new vehicles, as ODOT anticipates.

Table 5-4 summarizes the performance metrics established to measure the success of various technology components for the pilot program. Assessments of each functional component's performance follow in subsequent sections.

**TABLE 5-4: SYSTEM COMPONENT PERFORMANCE MEASURES**

| Function | Performance Measure | Assessment |
|---|---|---|
| Mileage data collection for fee calculation | Mileage collection accuracy | Overall, accurate +/- 2%<br>GPS systems far more accurate than OBDII |
| Associating a vehicle equipped with an on-vehicle device with the pump that is used to fuel the vehicle | Percentage of vehicles that could be correctly associated with a fuel pump | Powell station average: 88%<br>Sandy station average: 73% |
| Read mileage data from an on-vehicle device | Percentage of devices successfully read after vehicle fuel pump association is successful | No failures to read mileage once vehicle/fuel pump association was successful |

### ACCURACY

**Assessment**. The on-vehicle devices accurately collected mileage data and differentiated miles by geographic zones. Different types of on-vehicle devices, however, experienced different accuracy rates. Further research is necessary to determine cause of accuracy variability and find resolution prior to statewide implementation.

**Discussion.** There were two main types of on-vehicle devices used in the field test to collect mileage data. One device used speed data from the vehicles' OBDII port. The second device used a GPS receiver to compute mileage from vehicle position data derived after sufficient GPS satellite signal acquisition. The mileage collection accuracy of these devices varied.

Table 5-5 shows that overall accuracy of the on-vehicle devices was very high—within two percent on average. The GPS-only device showed higher accuracy, varying from -9.3 percent to +4 percent from the vehicle's odometer. The OBDII device produced a much greater range of variability. Ford models ranged from +21 percent to -18 percent, while GM and foreign makes ranged from +13.8 percent to -14.5 percent. The extent to which the odometers themselves were responsible for this variation is undetermined.

**TABLE 5-5: MILEAGE ACCURACY ASSESSMENT**

| Measure | #Samples | Average | Max | Min |
|---|---|---|---|---|
| Odometer mileage recorded | 46 | 9,493.2 | 68,271.0 | 1,332.0 |
| Overall Percent difference | 46 | -2.0% | 21.1% | -18.6% |
| GM/Foreign ODBDII | 19 | -1.0% | 13.8% | -14.5% |
| Ford ODBII | 8 | -7.5% | 21.1% | -18.6% |
| GPS-Only | 19 | -0.7% | 4.0% | -9.3% |

Although the system proved accurate in differentiating zones, improvements can be made to further increase accuracy with more detailed geographic information systems (GIS) programming.

### RELIABILITY

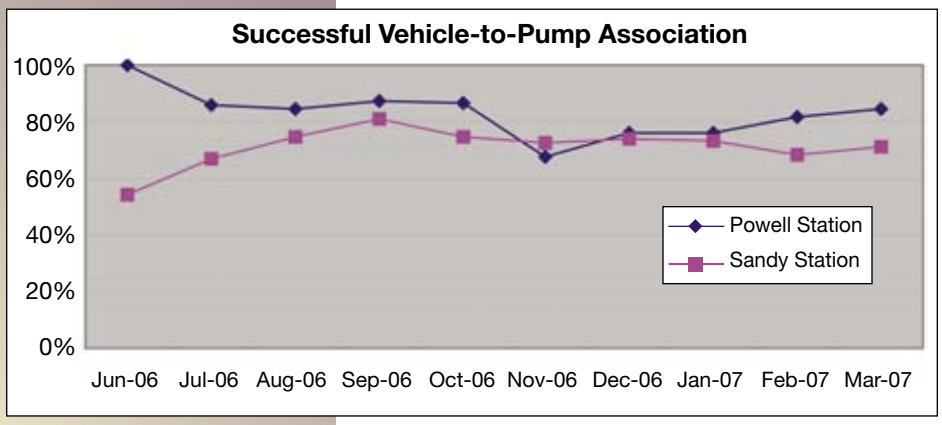
**Assessment.** At times, the mileage fee system employed in the pilot program charged participant motorists the gas tax and not the mileage fee. This occurred due to an inability of the mileage readers at the station to consistently determine at which pump a participant's vehicle was fueling. The system was designed to default to the gas tax if it could not confidently create a vehicle-to-pump association as a back up tax collection system. That aspect worked as planned. Nevertheless, the vehicle-to-pump association was not sufficiently reliable. When an association was successfully made, the system was completely reliable in downloading the mileage information from the on-vehicle device. Further research is required prior to statewide implementation to determine the most accurate vehicle-to-pump association methodology which will likely involve a communications system design where the RF antennas on the vehicle and the pump are in very close proximity. For example, the vehicle's fuel neck could be equipped with an antenna, whereas its counterpart could be installed on the pump's fuel nozzle. Alternative designs may involve antennas at every fueling location either embedded in the ground or installed on the fueling station's canopy.

**Discussion.** In keeping with ODOT's desire to minimize required changes in customer process steps associated with the mileage fee collection, the pilot program specified that no additional actions be required of the vehicle owner or fuel attendant when a vehicle was fueled and a mileage fee was assessed in place of the gas tax. Since most service station customers would not be pilot program volunteers, this requirement implied that the system had to determine automatically the fuel pump at which a vehicle equipped with an on-vehicle device was refueling.

*The dashboard display.*

Figure 5-2 summarizes the vehicle-to-pump association success rates at the two service stations. The success percentage was generally in the high 80s at the Powell Boulevard station and in the low to mid 70s at the Sandy Boulevard station. The poor performance at Powell in November was due to an incorrect computer setting at the station. Performance was improved at Sandy in August 2006, by installing one additional wireless communication device per fuel pump. The fuel pumps at the Sandy station were also much closer together than at the Powell station, thus increasing radio frequency interference and making it more difficult for the system to make correct vehicle-to-pump associations.

**FIGURE 5-2: SUCCESSFUL VEHICLE-TO-PUMP ASSOCIATION**




Variations in signal strength confused the transmission of wireless signals between the vehicle and the pump devices, and the use of generic commercial antennas may have weakened signal detection capability. Both of these issues can be addressed by additional development. This issue will also require additional research.

*OSU professor Dr. David Porter demonstrating a mileage fee transaction.*

There was never a known failure to read the mileage data once the vehicle-to-pump association was made. This is because the most difficult step in the process is the initial vehicle-to-pump association. If an error occurred, it occurred in that step. Once a link is established, the RF reader is then able to set and maintain a dedicated communication channel with the on-vehicle device for the duration of the transaction. Built-in anti-collision algorithms block out interference from other RF devices in the area.

The on-vehicle devices retrofitted into participating vehicles created some difficulties during the pilot program. Since ODOT does not envision widespread retrofitting for statewide implementation, owing to numerous technological, logistical and public acceptance issues, all of these difficulties can be considered pilot-specific. For purposes of completeness, however, these difficulties are noted here:

- Drained batteries. Sixty-eight participants reported that the on-vehicle devices drained their car batteries. This occurred because, due to resource and time limitations, manufacturers incorporated only limited power management functions on the on-vehicle device. This would not be the case with equipment built-in at point of manufacture or developed for installation prior to sale. Furthermore, ODOT will continue to explore retrofitting solutions that do not create this problem so that retrofitting may be enabled should this policy directive become desirable for statewide implementation.
- On-vehicle device incompatibility. The OBDII devices were developed specifically to work with vehicles built with OBDII standards. Unexpected problems arose, however, with some participant vehicles. In a few cases, the OBDII devices would simply not work with some vehicles even though they were expected to be compatible. In most cases, these devices were replaced with GPS-only devices and remained in the program.

### SECURITY

**Assessment.** Security was outside the scope of the pilot program and must be included in the next round of research. ODOT believes security of the on-vehicle technology can be accomplished through appropriate design within the vehicle as part of the manufacturing

process. Security of the equipment associated with statewide implementation must be assured or implementation cannot commence.

**Discussion.** Current technology development requires an antenna for RF communications and GPS signal acquisition. If accessible to the vehicle owner, it would be possible to cover the antenna so that RF communications and GPS signal acquisition are affected. In the case of complete signal blockage at refueling, the vehicle operator would be identified at the pump as a gas tax payer. The eventual fee structure and fuel tax rates will determine if there is enough incentive to discourage this type of equipment tampering. In the case of intermittent signal blocking during vehicle operation in an attempt to obtain a lower mileage fee assessment, ODOT would detect this type of evasion by identification of anomalies in mileage fee transaction data between fuel amounts purchased and miles driven for a vehicle with a certain fuel efficiency rating. Additional research should resolve the ability of motorists to interfere with antennas or will provide an alternative to antenna-based communications.

### EXPANDABILITY

**Assessment.** Specific testing of system expandability was outside of the scope of the pilot program and must be included in the next round of research. During the course of the pilot program, however, ODOT moved volunteer motorists to different fee structure categories by modifying a single code in the central database. It would have also been straightforward to change per mile fee rates for each fee structure category. Additionally, the pilot program required participants to visit an "independent mileage read station" at three specific time periods in the test. This additional facility may be viewed as an expansion of the system that utilizes the existing on-vehicle technology for a different purpose.

**Discussion.** In an eventual implementation of a mileage fee system, the on-vehicle devices should be designed to anticipate expanded use of the on-vehicle technology for different uses as well as possible adaptable/flexible congestion charging schemes. The same functionality used for vehicle identification may also be used for applications such as parking passes and automatic tolling. Other applications such as emergency vehicle location and navigation will require additional hardware or interfaces to additional add-on hardware.


### INTEROPERABILITY

**Assessment.** Interoperability was not taken into consideration in developing the equipment for the Road User Fee Pilot Program. Nevertheless, ODOT would like to pursue possible interoperability opportunities with toll collection and the national Vehicle Infrastructure Initiative (VII).

**Discussion.** The RF communications system employed for the Mileage Fee Pilot Program does not have the capability to interface with existing transportation applications (for example, toll collection). RF interoperability, however, was not required for the system employed in the pilot program. A large number of alternative RF technologies are commercially available (for example, Dedicated Short Range Communications (DSRC) and Wireless Fidelity (Wi-Fi)). Future implementation of a mileage fee system with hardware and software already integrated into vehicles by auto manufacturers, however, will most likely take advantage of a relatively new communications architecture known as VII. The Federal Highway Administration anticipates widespread use of VII due to its potential to enable a host of safety, mobility and commercial applications benefiting motorists.

## Evaluation criteria 5: Systemic precision

**Assessment.** Pilot program results indicate a mileage fee system can replace the fuel tax. The pilot program demonstrated that ODOT could implement calculation and collection of a mileage fee with no additional actions required from motorists or service station attendants, and that congestion-based fees may be easily incorporated into the system.

**Discussion.** Although the pilot program had certain technological difficulties, the major issues observed either can be overcome with additional development or were pilot-specific and therefore would not be included in the technology architecture for statewide implementation. Future designs that provide the reliability and robustness required for statewide implementation of a system similar to that used in this pilot program must consider issues such as the ability of the system to prevent evasion, the cost of implementation, and integration/interoperability with existing systems. The pilot program demonstrated specific choices with regard to these issues, but also demonstrated that there is a spectrum of choices in future systems.

### Evaluation criteria 6: Evasion potential

**Assessment.** Under the Oregon Concept, the evasion potential—both legal and illegal— is minimal due to lack of incentive to do so. Elements of this topic are covered earlier in this chapter.[55]

**Discussion.** A question arises about whether a motoring resident could legally avoid paying the mileage fee in Oregon by regularly purchasing fuel out of state. Purchasing fuel from out of state is technically tax avoidance and not evasion, since the motorist is paying a gas tax in the state in which the gas is sold. Since Oregon gas taxes are currently lower than neighboring states, the incentive to purchase out-of-state gas exclusively is virtually non-existent. Only motorists driving highly fuel-efficient vehicles close to a state border would benefit from such a tactic at current state gas tax rates. Even so, the difference would be minimal compared to the amount they would save on fuel costs. There is a strong likelihood that consumers would quickly determine that, as a practical matter, there is essentially no marginal benefit to incurring the cost of driving to another state to pay another state's gas tax in order to avoid the Oregon mileage fee. Such motorists would also quickly discover they would not be earning the gas tax credit offset inherent in the Oregon collection system. They would at some point sadly realize the huge mileage fee obligation that would be assessed if they ever found themselves in need of fueling up at an Oregon station or attempted to sell their vehicles. Never is a long time and precludes many activities in the middle part of a large state. This would likely dissuade Oregonians from attempting such a tactic.

### Evaluation criteria 7: Usefulness for phasing and partial implementation

**Assessment.** The pilot program proved the mileage fee can be phased in and partially implemented with both vehicles and service stations.

**Discussion.** The pilot program critically tested phasing and partial implementation. Nearly 98 percent of the fueling transactions at both participating service stations involved vehicles not equipped to pay a mileage fee. Those vehicles continued to pay the gas tax. Thus, the system as designed is ideally suited for phasing and partial implementation.

The system also demonstrated the feasibility of phasing introduction into service stations throughout a state. The pilot program was designed so that the system could be turned on and off through a software switch in the POS system as implementation of service station equipment proceeds. A start date for statewide implementation can be set after all service stations are equipped to process mileage-based fees.

### Evaluation criteria 8: Adaptability to congestion pricing

**Assessment.** The pilot program successfully tested congestion pricing by charging participants a higher fee when traveling in the Portland metro area during rush hour.

**Discussion.** The pilot program congestion pricing component used a different fee structure for rush hour volunteer participants. Rush hour was determined as any travel in the Portland metro urban growth boundary between 7-9 AM and between 4-6 PM on weekdays. Additional system features such as the following may be required to carry out more specific congestion pricing concepts:

- The ability to separate miles into more and smaller zones.
- Wireless updating of the zone information.
- Highly accurate electronic street maps.

Having these features may require more computing power and higher costs for the on-vehicle equipment. The central

55 *See Evaluation criteria 1: Administration, ease and cost of enforcement in this chapter.*

database component of the system will also be more complicated, especially if zone information is changed.

## Evaluation criteria 9: Public acceptance

### COSTS TO VEHICLE OWNER/OPERATORS

**Assessment.** The primary cost to a vehicle operator consists of the mileage fee itself. The amount of the mileage fee depends on the rate structure and the number of miles driven. Since ODOT does not envision retrofitting of on-vehicle devices in existing vehicles, the only cost to the vehicle owner would be the cost of the on-vehicle device embedded in the purchase price of the vehicle and any maintenance or replacement required, as is the case for any other vehicle equipment.

**Discussion**. The Oregon Concept envisions manufacture of the on-vehicle device into new vehicles by the auto manufacturers rather than retrofitting existing vehicles. Accordingly, costs for the on-vehicle device would be part of the purchase price of the vehicle. For the pilot program, ODOT paid for the on-vehicle device, installation costs and compensation for participation in the program. Although there were no planned project costs for the participants, some motorists did incur some additional incidental expenses related to the pilot program that were not covered by their contract with ODOT. Generally, these related to the consequences of theft or battery problems and ODOT made every attempt to offset these costs to the extent practicable.

### EASE AND CONVENIENCE TO VEHICLE OWNERS

**Assessment.** The pilot program found that participants believed the mileage fee system to be convenient.

**Discussion.** Though most questions about the ease and convenience of the pilot program relate to pilot-specific factors, such as the requirement for participants to fuel up at one of the two equipped gas stations, satisfaction with the arrangements was fairly high—71 percent vs. 22 percent dissatisfied.

Equipment function was a problem identified by 25 percent of respondents, and this no doubt caused some inconvenience to a segment of the study population, though virtually all such issues would be resolved in a real world, statewide deployment that applied refined, rather than experimental, prototype technology. The need for reimbursement when the experimental prototype equipment failed also caused some inconvenience but was a dissatisfactory component of the program for only six percent of the participants, an issue that would be eliminated in a real world implementation context.

The best indicator of ease and convenience of the mileage fee system to vehicle owners is when participants were asked, "If the program were changed so that participants could go to any local service station, would you have been willing to keep the equipment in your vehicle and stay with the same fee payment and refund of the gas tax?" 91 percent said, "yes."

### PRIVACY PROTECTION

**Assessment.** Participant concerns about protection of personal information during the course of the study started low and satisfaction with privacy safeguards remained high throughout the project. When surveyed, only three participants expressed serious concern with privacy of the system.

**Discussion.** ODOT representatives addressed issues of privacy early in the recruitment process, perhaps quelling participant concern and cementing their confidence in the robustness of the privacy safeguards in place. This same process would have to be duplicated statewide for real world implementation.

ODOT received feedback on privacy concerns from the service station operators as well. One participating station manager noted that the pilot program required stations to share data about a station's customer base with ODOT and indicated that the oil companies consider their customer base proprietary and do not want

*The best indicator of ease and convenience of the mileage fee system to vehicle owners is when participants were asked, "If the program were changed so that participants could go to any local service station, would you have been willing to keep the equipment in your vehicle and stay with the same fee payment and refund of the gas tax?" 91 percent said, "yes."*

to share this information with anyone. This sense of "ownership" of a customer base might hamper adoption of the current technology configuration. This raises important policy, privacy and data security issues that must be resolved prior to statewide implementation.

### FAIRNESS

**Assessment.** Although not specifically surveyed, participants expressed an understanding of the fairness of the mileage fee system in discussions with ODOT staff and at the study wrap-up discussion. Participants seemed to understand that the more you drive the more you pay.

**Discussion.** In ODOT's discussions with participants and potential participants, fairness of the congestion pricing element was sometimes mentioned due to a concern that motorists do not always have a choice when and where to travel. Specific examples included work-related scenarios. In order for motorists to see the fairness of the basic mileage fee, they must first understand the inherent inequities of the gas tax.

### TRANSPARENCY

**Assessment.** Participants overwhelmingly found the mileage fee system to be transparent. This provides support for employing similar transparency techniques during statewide implementation.

**Discussion.** ODOT set up the pilot program to be as transparent as possible, and survey results confirm that participants recognized the system as such. Participants found ODOT explanations of the program and the ODOT staff's ongoing provision of needed information overwhelmingly satisfactory—96 and 94 percent, respectively. Most motorists—70 percent—were satisfied with the accuracy of the equipment, and even those who were not—14 percent—could readily compare the accuracy of the pilot technology's mileage count against their car's own odometer to provide an easy check to ensure the system's accuracy. Receipts from the service stations provided a second check on mileage recorded, and provided a detailed breakdown (in certain experimental groups) of charges per zone and time.

The on-vehicle mileage screen provided a real time alert for when a vehicle changed zones. Participants knew ahead of time what the fee rates were for each zone.

### AVERSION/ATTRACTION

**Assessment.** Ultimately, participants found the idea of paying a mileage fee at the fuel pump in place of the gas tax attractive. This shows that public education and the ability to answer questions and resolve concerns of the motoring public and service stations are critical factors in the success of the mileage fee.

**Discussion.** The self-selecting nature of the participant pool indicates an initial attraction to the pilot program. While half of the volunteers admitted that the financial compensation was the primary factor triggering their participation, an interest in helping to find a gas tax alternative, environmental concerns and simply willingness to participate in research were factors for 40 percent of the volunteers. The PSU behavioral study noted, however, that participants on both the motorists and service station side were skeptical at first about the mileage fee. Concerns included worry about damage to vehicles from equipment installation, lack of knowledge about the mileage fee, mistrust of the technology, and doubts about its utility and overall acceptance. At the end of the project, surveys indicate that much of the aversion participants developed toward particular facets of the pilot program stemmed from pilot-specific issues such as placement of the device's display, occasional experimental equipment malfunction, and the requirement that fuel be purchased at particular service stations, rather than to elements relating to the basic configuration of the Oregon Mileage Fee Concept itself.

Nevertheless, despite some annoyances with pilot-specific issues, most of the participants appear to find the Oregon approach to collecting mileage fees attractive. After all, 91 percent of participants said they would have been willing to keep the on-vehicle equipment in their vehicles and continue paying the mileage fee rather than the gas tax if the system were extended to allow them to buy gasoline at any service station statewide.

CHAPTER 6

# Motorist and Station Operator Response

This chapter discusses the participant behavior and attitudes resulting from participation in the pilot program. Although behavioral research was not the primary objective of the pilot program,[56] ODOT was able to conduct a limited analysis of participant behavior.[57] ODOT expected participants to respond in different ways to the varied cost associated with the mileage charges relative to the gas tax, and the data collected allowed some analysis of that difference in behavior. Surveys and interviews provide direct information on how volunteers perceived the technology and their changes in travel behavior.

ODOT had three basic behavioral research objectives for the pilot program. First, determine whether switching from the gas tax to a mileage fee would cause motorists to change their driving behavior. Second, determine whether motorists would change their behavior in response to differential pricing associated with congestion. Third, determine whether the technology and collection system employed create any attitudinal issues for motorists or service stations.

Given that the first and second objectives require statistical analysis of changes in behavior associated with the pricing changes while the third objective requires information from the participants (both motorists and service station operators), participants agreed to join in a number of research exercises to test the technology as well as users' experience, attitudes and behaviors. As part of the pilot program, participants agreed to take part in three surveys. The owner and managers of the service stations agreed to be interviewed regarding their experience with the program.

*OSU professor Dr. David Porter explaining mileage fee technology to a Minnesota transportation official.*

## Field test design

### TWO FIELD TEST PHASES: CONTROL AND TEST[58]

As discussed in Chapter 4, the field test operated in two phases. The first five-month phase consisted of baseline data collection, called the control phase. ODOT instructed vehicle owners to drive normally, with the exception of refueling their cars at the participating service stations at least twice per month. When participants refueled their vehicles, the system wirelessly collected data on mileage by zone, but the volunteers continued to pay the state gas tax.

At the end of the control phase, relying on the recommendations of consultants from Portland State University (PSU), ODOT assigned participants to one of the two experimental groups or to a control group. In the second five months of the field test, when participants in the experimental groups refueled their vehicles at a participating station, the system deducted the gas tax and added mileage charges to their gasoline purchases. If participants fueled at

56 *The primary objective of the Road User Fee Pilot Program was testing and evaluating the technology and administrative conceptual framework for collecting a mileage fee in place of the fuel tax.*

57 *Rufolo,* Road User Fee Pilot Program: Review and Evaluation, *2007.*

58 *The ending date for the control group and VMT group in the experimental phase was March 25, 2007. The ending date for the rush hour group was March 11, 2007, because mileage data after that was unusable due to daylight savings time beginning two weeks earlier than anticipated owing to changes made by the Energy Policy Act of 2005.*

*Pilot participant Lee Younglove talking to US Transportation Secretary Mary Peters about his experience in the pilot program.*

non-participating stations or if a transaction did not occur correctly at a participating station, ODOT instructed participants to save the receipts and mail them to ODOT for a refund of the state gas tax paid. The next time they had a valid transaction at a participating station, the system would levy a charge for these uncharged miles. Participants in the control group continued as during the first phase.

### THREE TEST GROUPS: VMT, RUSH HOUR AND CONTROL

ODOT designed the pilot program, as described in Chapter 4, to test two types of mileage fees. The first type, a straightforward replacement of the gas tax, applied a flat per-mile charge to generate approximately the same amount of initial revenue as the gas tax for a vehicle with average fleet fuel efficiency. This flat per-mile charge group is called the VMT group.

The second type incorporated a premium for travel in congested zones at peak periods. ODOT defined the congestion zone as the area inside of the Portland Metropolitan Urban Growth Boundary from 7-9 AM and from 4-6 PM on non-holiday weekdays. This report refers to the participant group subject to this second type of mileage fee as the "rush hour group." The system charged vehicles in the rush hour group 10 cents per mile for peak period travel in the congestion zone, but only 0.43 cents per mile for other travel in the state.[59] In order to provide a basis for comparison, ODOT created a small control group that paid the state gas tax throughout the 10-month period of the field test.

ODOT's assignment of households to experiment and control groups was an effort to make a virtue out of necessity. For example, volunteers from households that ODOT discovered already had or, during the field test period, acquired ineligible vehicles, were assigned to the control group. This preserved the integrity of the test phase because unequipped vehicles could not be used by those in experimental groups without severely biasing the results. Similarly, households with vehicles that consistently missed reads at the gas stations were assigned to the control group. This action eliminated additional paperwork for reconciliation of taxes and fees due to the missed reads.

ODOT divided the remaining households almost equally between the rush hour and VMT groups. ODOT placed those volunteers (and their households) most likely to drive within the rush hour charge zone in the rush hour group. Segmentation of the volunteers ensured that at least one-third of the VMT group recorded substantial congestion zone travel.

### SAMPLING BIAS

Sampling bias was an unavoidable result of the vehicle eligibility parameters, the location of the participating gas stations, the program requirements and rewards, and associated non-random self-selection of participants.

### TESTING CHANGES IN TRAVEL BEHAVIOR

In order to capture the effects of non-pricing factors on observed changes in behavior or attitudes, ODOT set up the control group to not experience any change in pricing.

Researchers did not expect to see any significant change from the VMT group, since ODOT designed the fee to be essentially equivalent to the gas tax. Even in the most extreme example—where a vehicle getting twice the average fuel economy would see the 1.2-cents-per-mile fee as a doubling of the per-mile cost of driving—the absolute change was small,[60] especially compared to the other costs of driving.

59 *In order to adhere to the legislative intent of revenue neutrality for the pilot program, ODOT lowered the off-peak rate for the rush hour group to .43 cents per mile.*

60 *A motorist driving a high-mileage Toyota Prius 12,000 miles per year and charged a per-mile fee of 1.2 cents per mile, for example, would see a monthly increase of approximately $7 in mileage-based road user fees, compared to the consumption-based gas tax.*

ODOT expected the rush hour group to have the largest potential for behavioral change, mostly focused on travel in the congestion zone during rush hour. The ten-cent per mile charge was over eight times the average cost of driving based on the current gas tax, a large enough change to create substantial incentive for modifying a motorist's driving behavior.

Expected behavioral changes in response to this price increase were:

1. Changes in the time of day of travel, from peak periods to non-peak periods (especially the "shoulder" periods immediately before or after the peak premium period).
2. Shifts to different modes of travel, away from cars to other forms of transportation, such as public transit or bicycling.
3. Changes in route to roads outside of the congestion zone.
4. Decisions to forego trips that would have otherwise been made.

## Statistical analysis of volunteers' mileage data

### DESCRIPTIVE STATISTICS

Table 6-1 shows the average per-vehicle mileage data for each of the three groups.[61] Observed results include:

- In the control phase, mileage numbers for the control and VMT groups were similar, except for peak miles.
- As expected, there were only minor changes in the average mileage by category for the control group between the control and test phases.
- The VMT and rush hour groups show more substantial differences.

### PERCENT CHANGES BETWEEN CONTROL AND TEST PHASES

Table 6-2 compares vehicle-to-vehicle level paired baseline and experimental data for the control, VMT and rush hour groups.

- The VMT group showed a surprising reduction in total miles of more than three miles per day—12 percent.
- Though the VMT group drove more peak miles in the second five months of the field test, this may be due to seasonal factors.[62] Comments in the surveys and in a focus group session indicate that some of the participants in the VMT group did indeed reduce their driving based on more awareness of the number of short trips being taken and the number of miles driven.
- The reduction in total miles for the rush hour group was even larger than the reduction for the VMT group and, as expected, this group also reduced the number of peak miles driven. All changes are statistically significant.

This latter point is especially interesting, because ODOT and the research team had initial

61 *PSU calculated average peak miles per weekday by aggregating all peak hour miles reported for each vehicle and dividing that by the number of non-holiday weekdays in each period. Total Oregon miles and the total of all miles were calculated by adding up the appropriate miles within each time period per vehicle and then dividing by the number of days that the vehicle had participated within each time period.*

62 *That is, the experiment from November-March was concomitant with the long nights and heavy schedules of work and school days, whereas the baseline included long days and summer vacation schedules. (Vacations increase VMT, but decrease peak period driving.)*

**TABLE 6-1: AVERAGE MILEAGE PER VEHICLE, BY TEST GROUP/TEST PERIOD**

| Mileage Parameter and Time Period | Control Group (N=10) Average Miles | VMT Group (N=95) Average Miles | Rush Hour Group (N=102) Average Miles |
|---|---|---|---|
| Avg. Peak Miles/Weekday- Control Only | 7.50 | 4.67 | 8.41 |
| Avg. Total OR Miles/Day- Control Only | 23.61 | 22.83 | 30.92 |
| Avg. Total Miles/Day- Control Only | 26.41 | 25.94 | 34.74 |
| Avg. Peak Miles/Weekday- 3/11/07 Termination | 8.68 | 5.25 | 7.31 |
| Avg. Total OR Miles/Day- 3/11/07 Termination | 22.64 | 20.88 | 26.51 |
| Avg. Total Miles/Day- 3/11/07 Termination | 25.41 | 23.09 | 29.64 |
| Avg. Peak Miles/Weekday- 3/25/07 Termination | 8.81 | 5.19 | 7.14 |
| Avg. Total OR Miles/Day- 3/25/07 Termination | 22.50 | 20.77 | 26.15 |
| Avg. Total Miles/Day- 3/25/07 Termination | 25.49 | 22.75 | 29.19 |

concerns that the lower off-peak charge would encourage rush hour motorists simply to shift into the "shoulders" of the peak periods. Not only did this not happen, but notably, the reduction in peak miles was accompanied by further reductions in off-peak miles. As pointed out earlier in this chapter, the rush hour group is not representative of all Portland area motorists.

### FACTORS RELATED TO TRAVEL BEHAVIOR CHANGES

The first step was examination of the baseline data for peak miles per weekday, total Oregon miles per day and total miles per day. A regression analysis was performed to determine if the various demographic or attitudinal variables affected existing driving patterns.

### FACTORS AFFECTING RUSH HOUR MILES DURING CONTROL PHASE

The important demographic, attitudinal and exogenous factors statistically associated with the number of rush hour miles driven per vehicle per day by each household for the control period, are as follows:

- The number of rush hour miles per vehicle goes down the more vehicles there are per household, probably resulting from spreading the miles over additional vehicles.
- Larger households, higher incomes and the presence of children younger than 16 years of age are associated with an increase in the number of rush hour miles driven by household motorists.
- Transit access less than four blocks away correlates to less rush hour miles per vehicle by more than two miles per day.
- Those who believe that commuting without a car is a hassle drive over two miles per day of rush hour driving relative to people who do not share that opinion.

### FACTORS AFFECTING TOTAL MILES AND OREGON (IN-STATE) MILES TRAVELED DURING CONTROL PHASE

- Those who needed a car because of schedule changes also showed a higher amount of total miles driven by almost six miles per vehicle per day than the other motorists.

The next step was to examine whether demographic or attitude variables helped explain changes in behavior between the control phase and test phase ending March 11, 2007.

**TABLE 6-2: COMPARISON OF VEHICLE-LEVEL PAIRED SAMPLES-CONTROL, VMT AND RUSH HOUR GROUPS (CONTROL + MARCH 25, 2007 TERMINATION)**

| **Measure:** Miles Per Day From Test Minus Miles Per Day From Control | | **Control Group: Percent Change** | **VMT Group: Percent Change** | **Rush Hour Group: Percent Change** |
|---|---|---|---|---|
| Pair 1 | Total Miles | -1.606% | -11.904% | -13.812% |
| Pair 2 | Oregon Miles | -1.702% | -8.592% | -13.216% |
| Pair 3 | Off Peak Miles | -5.009% | -11.414% | -12.363% |
| Pair 4 | Peak Miles | 13.668% | 12.284% | -13.865% |
| Pair 5 | Total Miles (3/25/07 end) | -0.736% | -12.689% | -15.507% |
| Pair 6 | Oregon Miles (3/25/07 end) | -1.799% | -8.954% | -14.776% |
| Pair 7 | Off Peak Miles (3/25/07 end) | -6.256% | -11.815% | -13.894% |
| Pair 8 | Peak Miles (3/25/07 end) | 16.617% | 11.162% | -16.117% |

### FACTORS AFFECTING CHANGE IN RUSH HOUR MILES IN TEST PHASE

Statistically significant rush hour group findings include:

- Rush hour group reduced peak period travel by about 22 percent relative to the VMT group, a statistically significant amount.[63]
- Looking at the attitude variables, the statistically significant finding is that households with transit access within four blocks reduced their rush hour miles by an additional 0.742 miles per day.
- Those with the attitude that they would always drive show an increase of more than four miles per day more than others without that attitude. This essentially means that they did not reduce their driving based on other characteristics.

Nearly statistically significant findings:

- Households with children under 16 reduced their rush hour driving by 0.754 miles per day, holding everything else constant.

Not statistically significant, but interesting:

- Those who characterized commuting without a car as a hassle, or feel they need a car because their schedule frequently changes, also reduced their peak hour mileage relative to others who disagreed with these statements. This seems to indicate that even those with a strong perception of reliance on a car may be willing to change behavior in response to price incentives.

## Experience of participant motorists

### SURVEY STRUCTURE

Three surveys conducted at the beginning, mid-point and end of the field test provide insight into the experience of the participant motorists. Table 6-3 summarizes the survey effort. All three surveys included questions about the household, its travel patterns, and attitudes. This allowed comparison over time and among the control and two experimental groups, so that researchers could identify changes in vehicle usage and attitudes during the course of the experiment.

At the beginning, 221 households enrolled in the pilot program. For a number of reasons that number declined to 191 by the conclusion of the experiment in March 2007.

**TABLE 6-3: SUMMARY OF PILOT PROGRAM SURVEY SCHEDULE, TOPICS AND SAMPLE SIZE**

| March 2006 Recruitment Results—Registered Participants | # Households | # Participants (Motorists) | # Vehicles |
|---|---|---|---|
| **Totals:** | **221** | **299** | **285** |
| **Survey 1: June 20-29, 2006**<br>***Survey Focus:***<br>• Reasons for participating<br>• Understanding of pilot program<br>• Installation & early operational experience with on-vehicle device<br>• Travel patterns & attitudes | | | |
| **Response Totals:** | **194** | **288** | **274** |
| **Survey 2: October 25 – November 8, 2006**<br>***Survey Focus:***<br>• Experience with equipment<br>• Experience with pilot program features<br>• Travel patterns & attitudes | | | |
| **Response Totals:** | **190** | **270** | **256** |
| **Survey 3: March 15 – April 10, 2007**<br>***Survey Focus:***<br>• Behavior changes<br>• Experience with equipment<br>• Experience with pilot program features<br>• Travel patterns & attitudes | | | |
| Control | 20 | 32+ | 31 |
| VMT | 79 | 109 | 106 |
| Rush Hour | 84 | 123 | 114 |
| **Response Totals:** | **183** | **264** | **251** |

**First survey findings**

Slightly over half the sample indicated that the monetary incentive was one of their reasons for participating. The next most cited set of reasons—38 percent—was that the pilot program seemed interesting or they were curious. The third most cited reason—18 percent—was to assist in finding an alternative to the gas tax.

Survey respondents were asked about their level of concern with respect to a prepared list of 10 issues that ODOT and researchers thought potentially problematic. The results, shown in Table 6-4, indicate a few areas of small to moderate concern at the beginning of the project, primarily accuracy of the mileage readings, fear of burglary due to the

63 *This amounts to a reduction of 1.5 miles per day within the rush hour zone when the rush hour group is compared with the VMT group.*

*Rush hour group reduced peak period travel by about 22 percent relative to the VMT group, a statistically significant amount.*

visible on-vehicle equipment, and having to purchase gasoline at the specified gas stations.

The lowest "no concern" response was 52 percent and half the identified initial concern areas drew a "no concern" response ranging from 82 percent upward to 90 percent of those surveyed. In general, the volunteers seemed reasonably comfortable with the on-vehicle and station equipment and the process for the experiment.

With regard to privacy, 82 percent had "no concern" about privacy, while only three percent rated it a "great concern." Of course, the volunteers are not a representative group, since most people with a great concern may not have volunteered for the project. Furthermore, since the volunteers received explanations of how the equipment worked and what information would be collected, this may also have had a calming effect.

Most of the sample—96 percent—were "very satisfied" or "somewhat satisfied" with the explanation of requirements for participating in the pilot program, and 92 percent of volunteers surveyed were either "very satisfied" or "somewhat satisfied" with ODOT staff's explanation of program protocols.

**Second survey findings.** In general, participants were satisfied with the program, but some experienced technological difficulties with the on-vehicle equipment or at the participating service stations. As seen in Table 6-5, most of the participants were satisfied with the information provided and having questions answered by ODOT staff. The three most common areas of dissatisfaction were pilot-specific: the functioning of the on-vehicle device and display, the positioning and mounting of the display, and the requirement to purchase gas periodically at the participating stations. One hundred thirty of the 190 respondents reported no problems with batteries as a result of the retrofitted pilot program equipment. As discussed in Chapter 5 of this report, however, some participants reported that the on-vehicle device drained batteries and several had to be replaced. Overall, 37 participants—20 percent—were dissatisfied with some aspect of the functioning of the device, most of which were pilot-specific and relatively minor.

The positioning of the display was a source of dissatisfaction. This can be attributed to installation methods that ensured the display would be easy to remove at the end of the experiment. Apparently this goal was achieved: 41 percent of those who identified a problem with the display said that it tended to fall off its temporary mounting.

Thirteen percent of the respondents were dissatisfied with having to purchase gas at the participating service stations. For some, the stations were simply inconvenient in terms of location or hours of operation.

Participants' views of the accuracy of the equipment improved as experience replaced conjecture. While the first survey recorded nearly 30 percent of respondents with some or great concern about the accuracy of the mileage device, the second survey, which reflects actual experience with the equipment, showed that only five

**TABLE 6-4: INITIAL CONCERNS- SURVEY 1**

| Concerns with the Program | Great Concern | | Some Concern | | No Concern | | N/A | |
|---|---|---|---|---|---|---|---|---|
| Fear of Burglary Due to Visible Equipment | 11 | 6% | 81 | 42% | 101 | 52% | 1 | 1% |
| Having to Purchase Gas at Leathers | 9 | 5% | 62 | 32% | 123 | 63% | 0 | |
| Whether Payment will be Worth Effort | 9 | 5% | 55 | 28% | 126 | 65% | 4 | 2% |
| Accuracy of Mileage Readings | 14 | 7% | 44 | 23% | 135 | 70% | 1 | 1% |
| Impact of Equipment on Vehicle | 9 | 5% | 50 | 26% | 135 | 70% | 0 | |
| Privacy Associated with Equipment | 6 | 3% | 29 | 15% | 159 | 82% | 0 | |
| Ability to Participate for Full Year | 9 | 5% | 21 | 11% | 164 | 85% | 0 | |
| Getting Full Household Participation | 6 | 3% | 8 | 4% | 172 | 89% | 8 | 4% |
| Going to Reader Station 3 Times | 2 | 1% | 17 | 9% | 174 | 90% | 1 | 1% |
| Friends and Neighbors Opinions | 2 | 1% | 15 | 8% | 175 | 90% | 2 | 1% |

**TABLE 6-5: SATISFACTION- SURVEY 2**

| Features of the Program | Satisfied | | Neutral | | Dissatisfied | | N/A | |
|---|---|---|---|---|---|---|---|---|
| Getting Information about the Program | 182 | 96% | 6 | 3% | 0 | 0% | 2 | 1% |
| Having Questions Answered | 175 | 92% | 9 | 5% | 3 | 2% | 3 | 2% |
| Privacy Associated with Equipment | 159 | 84% | 23 | 12% | 3 | 2% | 5 | 3% |
| Having to Purchase Gas at Participating Stations | 154 | 81% | 9 | 5% | 26 | 13% | 1 | 1% |
| Out of Pocket Costs for Fuel | 152 | 80% | 23 | 12% | 8 | 5% | 7 | 4% |
| Where the Display was Positioned in Vehicle | 145 | 76% | 6 | 3% | 39 | 20% | 0 | 0% |
| Accuracy of Mileage Readings | 142 | 75% | 15 | 8% | 5 | 3% | 28 | 15% |
| The Functioning of the Equipment | 143 | 75% | 8 | 4% | 37 | 20% | 2 | 1% |

participants—three percent—were dissatisfied with the accuracy of the mileage readings.

**Third survey findings.** In general, participants were satisfied with most aspects of the program, but some experienced technological difficulties with the on-vehicle equipment or at the service stations. As seen in Table 6-6, most of the participants remained satisfied with the information provided and having their questions answered. The three largest areas of dissatisfaction were the functioning of the on-vehicle device, the positioning of the display, and having to purchase gas at the participating stations. The amount of dissatisfaction with each of these issues increased slightly from levels recorded in the second survey. The responses for some of the questions should be viewed carefully due to the large percentage of people for whom the question was not applicable. A question was added regarding satisfaction with the procedure for reimbursing gas tax paid at non-participating stations, or when a vehicle was not correctly identified at a participating station. Ten households reported dissatisfaction with the procedure, but many never have had to use it, either because they were part of the control group or because they had had all of their purchases successfully completed at a participating station. The percentage dissatisfied with purchasing gas at the participating stations rose from 13 percent in the second survey to 22 percent in the final survey. Participants cited numerous reasons for dissatisfaction. One reason related to difficulties with the fuel pump association with a participant's particular vehicle to enable a gas tax credit against the fuel purchase price at the pump. When the system did not work, participants had to complete the extra step of sending in the receipts to ODOT for the gas tax refund. A second reason cited was the stations inability to pump gas at various times.

A third reason cited by 14 people—representing seven percent—was dissatisfaction with the accuracy of the mileage readings. Though this is an increase compared to the three percent of dissatisfied respondents in the second survey, this represents only half of those who thought there might be accuracy problems at the beginning of the pilot program. A variety of other experiences may have caused the increase. One person noted that the readings on his display screen were different from readings on the odometer. Others were dissatisfied with the requirement to buy gas at prescribed locations. There were also a few equipment misreads that could also have had the effect of raising suspicions about equipment accuracy as well. Moreover, for a short time, the devices were incorrectly identifying the rush hour period because they had been programmed for the change to daylight savings time at the traditional time rather than the early March date imposed by the Energy Policy Act of 2005. It is likely that the change in time for rush hour was at the root of some of the accuracy concerns.

*A fuel pump outfitted with mileage reading equipment.*

**TABLE 6-6: SATISFACTION- SURVEY 3**

| Features of the Program | Satisfied | | Neutral | | Dissatisfied | | N/A | |
|---|---|---|---|---|---|---|---|---|
| Getting Information About the Program | 176 | 96% | 3 | 2% | 3 | 2% | 1 | 1% |
| Having Questions Answered | 171 | 94% | 4 | 2% | 5 | 3% | 3 | 2% |
| The Functioning of the Equipment | 126 | 69% | 12 | 7% | 45 | 25% | 0 | 0% |
| Having to Purchase Gas at Leathers | 131 | 71% | 11 | 6% | 41 | 22% | 0 | 0% |
| Accuracy of Mileage Readings | 128 | 70% | 13 | 7% | 14 | 7% | 28 | 15% |
| Privacy Associated with Equipment | 126 | 69% | 23 | 13% | 3 | 2% | 31 | 17% |
| Out of Pocket Costs for Fuel | 131 | 71% | 14 | 8% | 13 | 7% | 25 | 14% |
| Where the Device was Positioned In Vehicle | 132 | 72% | 7 | 4% | 44 | 24% | 0 | 0% |
| Getting Reimbursed for Receipts | 101 | 62% | 8 | 5% | 10 | 6% | 44 | 25% |

### REACTION TO THE EXPERIMENT

As previously described in Chapter 4, rush hour group members had a financial incentive to change their behavior, but would not be penalized for failing to change. The participants in this group

*Twelve of the 84 households in the rush hour group reported that someone in the household began using alternative transportation modes to save money.*

*Leathers Fuels station manager, filling up a vehicle during the pilot program.*

were asked directly how difficult it was to figure out how to save money. Three households reported that it was very difficult and 11 found it somewhat difficult, forming a combined 17 percent response.

Behavior changes in the rush hour group were expected, and some were observed. Twelve of the 84 households in the rush hour group reported that someone in the household began using alternative transportation modes to save money. Twenty-six also reported that someone in the household changed either the time or distance of travel to save money. Mostly this was by avoiding driving in the congestion zone during rush hour—23 households—although four households reported grouping errands or consolidating trips and one reported using a carpool.

The price per mile for the VMT group was set to approximate the gas tax, so little change in behavior was anticipated for this group. Surprisingly, however, 10 of the households in the VMT group reported that someone in the household started taking transit, took up biking, or began walking to save money through the program. This may be attributable to an increase in attentiveness owing to ready viewing of the display and simply participation in the pilot program itself.

Finally, as noted in Chapter 5, the participants were asked, "If the program were changed so that participants could go to any local service station, would you have been willing to keep the equipment in your vehicle and stay with the same fee payment and refund of the gas tax?" This question was asked of the 163 households in the VMT and rush hour groups and 149 households—91 percent—answered yes. Although the pilot program did not perfectly mimic a real world implementation situation (because none of the households actually had to make any out-of-pocket mileage fee payments), this result shows a strong willingness to accept a new system once people have become familiar with it.[64]

## Experience of gas station owner and managers

Also of importance to ODOT and the task force is the experience of the private sector businesses that would be implementing the mileage fee in Oregon. Although many of the issues identified arose solely because of the pilot-related equipment and software limitations, the lessons learned from interviews with ODOT's private sector partner will help refine the Oregon Mileage Fee Concept.

A small independent oil company owns both of the two participating gas stations. The owner of the company chose to participate in ODOT's pilot program, but the service station managers contended with the daily operation of the system. PSU interviewed both the owner and the managers on the installation and use of the technology for collecting mileage fees at the pump.

### INSTALLATION EXPERIENCE

The owner also indicated that in addition to adjusting to a new POS system and credit card network provider, a process had to be worked out to make the new system compatible with the company's internal computer system for tracking purchases on a daily basis. The owner felt the process was disruptive and time consuming. At the station level, one manager expressed some concern about learning the new software system; the other two managers did not.

During all of these activities and changes the owner found ODOT staff to be helpful, despite the fact that the installation process took longer than expected.

64 *It should also be recognized that this is not a random sample of the population; and the same motives that caused people to volunteer may make them more accepting of other changes than the population at large.*

### OPERATIONS EXPERIENCE

The owner and managers did not anticipate major changes in the way attendants handled or delivered gas at the pump with the implementation of the mileage fee technology, nor did they anticipate that there would be any major impacts on the customer. In general, their expectations were met. All the interviewees agreed that the pumps operated well and that the process of pumping gas was the same. The only problems noted were that sometimes participating motorists were charged the gas tax instead of the mileage fee due to a non-read error. As explained in Chapter 5, in those cases where data or vehicle identification information did not read, the system was programmed to charge the gas tax as normal. Although the system was working as designed in that respect, the failures that participants occasionally experienced in connecting at the pump annoyed them, as surveys reflected. These participants would then ask questions about the program that station personnel could not answer.

### PROBLEMS WERE PRIMARILY PILOT-SPECIFIC

The interviews identified a number of problems from the perspective of the owner and managers of the stations participating in the experiment. The owner noted that adoption of the technology was more work and costly than expected.

A second problem was pilot-specific and related to changing the credit card network. There were administrative difficulties in contracting with a credit card network provider authorized to work with ODOT's POS system. In full implementation, this would not be an issue because stations would simply modify their own POS systems and thus eliminate the need for a new credit card network.

In addition to the changes at the stations described above, the owner stated that a process had to be worked out to make the new system compatible with the company's internal computer system for tracking purchases daily. This adjustment also added to the time and resources required for installation.

Over the course of the pilot, the computer experienced operational problems. Both participating stations experienced periods when they could not pump any gas because the computer system was down. The initial problem with the computer system at one station was a bad computer cable (noted earlier). Notwithstanding station managers' reports that, by the last month of the pilot program, the computers at both stations were freezing up two to three times per week, there were only 18 recorded incidents, according to the technology team at OSU. It was determined that the solution to the problem was to reboot the computer. While simple, rebooting also took time and often resulted in lost revenue and disgruntled customers, according to both station managers.

## A few glitches, but the system worked

A major purpose of the survey effort was to identify problems that could be corrected. Several issues with the on-vehicle devices were noted by the participants, though most were pilot-specific issues that would not affect real world program deployment.

The service station owners and operators, on the other hand, would require substantial improvements in several areas, the most important of which would be creation of a system permitting station owners a choice in the type of POS system used. Owing to the practical limitations discussed in Chapter 3, only one POS system could be used for the pilot program.

Owners would also require greater system reliability. Further, if the system were mandated statewide, additional costs for new fuel pumps with required communication capabilities would have to be addressed in some cases, but most station owners should already be equipped with the appropriate fuel pumps. There also appear to be other costs associated with accommodating the mileage fee system, such as re-establishing coordination with internal accounting systems, which would have to be addressed.

Despite issues identified by the station owner, an overwhelming majority of the motorists participating in the pilot program say they would be willing to continue using the mileage fee system as a replacement for the gas tax if they could go to any service station to purchase fuel and have their mileage data collected. The self-selection of the participants into the experiment may mean they are more open to such changes than the general population, but without additional research it is impossible to say for sure. Nevertheless, other than problems associated with the experimental equipment, the mileage fee system employed was not perceived as a burden. For motorists, the Oregon Mileage Fee Concept, as tested, worked the way ODOT intended it to work.

CHAPTER 7

# Public Outreach, Literature Review and Response to Critical Analysis

The task force and ODOT developed the mileage fee concept as an Oregon solution. Even so, ODOT recognized that such an innovation would likely attract scrutiny from across the nation. Accordingly, ODOT designed the project Web site to communicate every step of development in a transparent manner and offer two-way communications so anyone could ask questions and offer views.[65]

In the early years, excellent points made by concerned citizens in Oregon and across the US resulted in adjustments to the Oregon Mileage Fee Concept. Even when ODOT did not directly incorporate their views into refinement of the concept, communications with everyday citizens proved helpful to ODOT in honing its message to reduce the opportunity for misunderstandings.

Midway through conceptual development, ODOT determined a strategic objective leading to ultimate adoption of the Oregon Concept was to gain serious consideration by transportation policymakers throughout the United States and become part of the national debate on the future of transportation funding in the 21st century. ODOT has achieved this objective.

This chapter summarizes how others across the western world have received, characterized and evaluated Oregon's experiment before release of the pilot program results.

## Initial and ongoing public outreach

As part of ODOT's commitment to public engagement and transparency, the task force held three public hearings during the first year of investigations and accommodated public testimony during each of its meetings. ODOT staff accepted invitations and presented the Oregon Mileage Fee Concept at local clubs, business associations and chambers of commerce. This local communications effort continues unabated.

ODOT's plans for future public communications include an extensive effort to gauge public opinion and educate citizens on the road revenue shortfall facing the state. This effort should include discussions of the economic and sociological impacts of reduced road revenue and proposals for resolution of this condition, including a mileage fee.

### FORMAL PRESENTATIONS

As part of an ongoing communications effort, ODOT staff regularly briefed ODOT management, Oregon Congressional delegation staff, USDOT staff, United States Secretary of Transportation Mary Peters, the Oregon Transportation Commission, state legislative committees, and two national surface transportation commissions. Similarly, ODOT presented the Oregon Mileage Fee Concept many times to citizen groups, state departments of transportation, metropolitan planning organizations and transportation advocacy groups in all corners of Oregon and the United States.

ODOT determined in August 2003 that Oregon would likely need the alliance of other states and probably the federal government before legislative approval of statewide implementation becomes realistic. From that point forward, ODOT embraced the mission of taking the Oregon Mileage Fee Concept to the nation.

Beginning with the most recent conferences and meetings, Table 7-1 lists ODOT's formal presentations on Oregon Concept and pilot program from July 2005 through October 2007. The 2005 Report to the Legislature identified 25 conference presentations during the 2003-2005 biennium.

65 *See http://www.oregon.gov/ODOT/HWY/RUFPP/rufif.shtml*

**TABLE 7-1: FORMAL PRESENTATIONS OF THE OREGON MILEAGE FEE CONCEPT (JULY 2005 - OCTOBER 2007)**

| Conference/Symposium | Location | Date |
|---|---|---|
| **2007 (to date)** | | |
| North Dallas Chamber of Commerce – Transportation Crossroads Conference | Dallas, TX | October 31, 2007 |
| Global Trade & Transportation Symposium | Jacksonville, FL | October 25, 2007 |
| Bond Buyer's 8th Annual Transportation/P3 Conference | Tempe, AZ | October 18, 2007 |
| Silicon Valley Leadership Group "Public Private Partnerships – A Strategy to Rebuild California" | San Jose, CA | October 17, 2007 |
| Inaugural William O. Lipinski Symposium on Transportation Policy - "Moving the Region in a New Direction" | Chicago, IL | October 15, 2007 |
| 2007 Northwest Regional Right-Of-Way Conference The Council of State Governments-WEST Annual Meeting | Seaside, OR | September 26, 2007 |
| Transportation and Trade Committee 2007 American Public Works Association International | Jackson Hole, WY | September 18, 2007 |
| Public Works Congress & Exposition | San Antonio, TX | September 10, 2007 |
| National Surface Transportation Infrastructure Financing Commission | Washington, DC | September 5, 2007 |
| Georgia Legislature's Joint Study Committee for Transportation Funding | Dalton, GA | August 28, 2007 |
| National Surface Transportation Policy & Revenue Study Commission | Washington, DC | July 25, 2007 |
| Minnesota Chamber of Commerce Transportation Policy Committee | Teleconference (St. Paul, MN) | July 18, 2007 |
| Silicon Valley Transportation Policy Committee | Teleconference (Santa Clara, CA) | July 12, 2007 |
| Keep Florida Moving—2007 Floridians for Better Transportation Leadership Retreat | Sarasota, FL | June 29, 2007 |
| Highway Engineering Exchange Program | Portland, OR | June 27, 2007 |
| National Association of Regional Councils Annual Meeting | Orlando, FL | June 25, 2007 |
| Future of Transportation Finance Conference | Seattle, WA | June 19-20, 2007 |
| Governor's Transportation Finance and Implementation Panel | Denver, CO | May 31, 2007 |
| Colorado Transportation Finance Forum | Denver, CO | May 30, 2007 |
| 18th Annual Center for Transportation Studies Transportation Research Conference, University of Minnesota Center for Transportation Studies | St. Paul, MN | May 1, 2007 |
| Focus Georgia Conference | Atlanta, GA | April 25, 2007 |
| AASHTO Standing Committee on Finance and Administration: Meeting on Long-Term Transportation Finance Funding Options | Teleconference (New Orleans, LA) | April 12, 2007 |
| EU Road User Charging 2007 Conference | London, UK | January 23, 2007 |
| **2006** | | |
| International Bridge, Tunnel and Turnpike Association (IBTTA) National Surface Transportation Policy and Revenue Study | Washington, DC | December 6, 2006 |
| Commission Field Hearings | Portland, OR | October 27, 2006 |
| American Association of State Highway and Transportation Officials Annual Meeting | Portland, OR | October 28, 2006 |
| Road User Charging: Charging Ahead Conference | London, UK | October 26, 2006 |
| North Salem Lions Club | Salem, OR | September 26, 2006 |
| Portland Freight Advisory Committee | Portland, OR | September 7, 2006 |
| Motor Carrier Transportation Advisory Committee | Roseburg, OR | August 25, 2006 |
| Capitol City Lion's Club | Salem, OR | August 22, 2006 |
| Salem Downtown Lion's Club | Salem, OR | July 13, 2006 |
| Portland Business Alliance | Portland, OR | June 27, 2006 |
| First Annual Texas Transportation Conference | Austin, TX | June 9, 2006 |

CONTINUED ON NEXT PAGE

**TABLE 7-1: CONTINUED FROM PREVIOUS PAGE**

| | | |
|---|---|---|
| Oregon Association of County Engineers and Surveyors | Bend, OR | April 27, 2006 |
| Sustainable Advantage Conference | Eugene, OR | April 21, 2006 |
| Transportation Research Forum (FHWA) | New York, NY | March 23, 2006 |
| Delegation from Japanese Ministry of Land, Infrastructure and Transport | Salem, OR | January 19, 2006 |
| **2005 (July-December)** | | |
| Maine Transportation Conference | Augusta, ME | December 1, 2005 |
| Pennsylvania Highway Information Association | Hershey, PA | November 9, 2005 |
| ITS Oregon Electronic Payment System Workshop | Portland, OR | November 2, 2005 |
| Southeast Michigan Council of Governments | Detroit, MI | October 11, 2005 |
| Northeast Area Commission on Transportation | La Grande, OR | August 4, 2005 |
| TRADCO | Medford, OR | July 12, 2005 |

## Local print, broadcast and electronic media

Early in the mileage fee conceptual development, much of the Oregon print media reacted negatively to ODOT's mileage fee effort because of inaccurate assumptions. ODOT staff made extensive efforts to correct these assumptions and, as a result, 2005 mainstream media portrayals generally became more balanced, although not yet consistently accurate.

A local media breakthrough occurred April 8, 2006, when Oregon's principal statewide newspaper, The Oregonian, printed an extensive story about the pilot program that treated the Oregon Mileage Fee Concept fairly and accurately. The media follow up to this story moved Oregon mainstream media attention to positive at best, and neutral at worst, but reporting became much more accurate. Following The Oregonian article, all the major local television stations produced objective news stories on Oregon's effort and major local radio stations did the same. ODOT received less citizen comment in response to this local media blitz than to any other significant news story in the national or local media. ODOT concludes that accurate and widespread media communications during this media event led to a higher level of public understanding, suggesting that effective communications can lead to public acceptance.

## State agency and research reviewers see "Promise and Hurdles"

Writers perceive the Oregon Concept from many perspectives.[66] Some writers categorize the mileage fee as a revenue source, others as an infrastructure improvement plan. Still others depict it as a boon to congestion management, land use, energy, or air quality goals. Focus varies according to point of view. Authors looking at regional funding find Oregon's experiment interesting because of the possibility of accessing the new mileage fee system by metropolitan planning organizations (MPOs) looking for fair and stable means to fund regional plans, manage growth, contain air pollution and support better land use decisions.[67]

Wherever they go, Oregon representatives learn that other states "share our pain." States face essentially the same set of structural problems with the gas tax as Oregon, and they demonstrate a genuine and earnest interest in Oregon's approach. The literature published under the auspices of state agencies (usually other departments of transportation), state legislatures[68]and state university research centers[69] are particularly adept at balanced reporting and even-handed critiques of the ongoing work in Oregon. States may simply have the same worries.

Despite strong interest in most corners, the Oregon solution does receive mixed reviews—where one reviewer sees promise and

66 *See Appendix J for a list of literature reviewed.*

67 *University of California, Berkley Institute of Transportation Studies and ICF Consulting,* Metropolitan-Level Transportation Funding Sources, *American Association of State Highway and Transportation Officials, December 2005.*

68 *Lisa Conley,* Oregon's Road User Fee Pilot Program, Research Spotlight, *Texas Senate Research Center, April 2006. Matt Sundeen,* States Shift Gears, State Legislatures, *the National Conference of State Legislatures, December 2006.*

69 *Ibid. University of California 2005.*

simplicity, another sees complexity.[70] In some cases, researchers point out areas where Oregon's strategy does indeed need elaboration, such as the task force's lack of including "efficiency" in its list of criteria for a gas tax replacement, even though the task force chose efficiency-driven congestion pricing in its policy recommendations.[71] The task force has not focused on efficiency aspects of the Oregon Concept largely because the mission established by the Oregon legislature related to revenue generation rather than roadway efficiency. Governance issues related to highway and arterial performance were simply not part of the task force's charge. Even so, the electronic platform established through the Oregon Concept has tremendous flexibility to manage roadway efficiency issues. The Oregon Concept precludes nothing in this regard. ODOT and the Oregon Transportation Commission intend due consideration of roadway efficiency issues before employment of congestion pricing strategies in Oregon.

*OSU professor, Dr. David Kim shows former Governor John Kitzhabar the mileage fee receipt.*

Called "one of the most promising examples"[72] of a mileage-based solution, Oregon's pilot program is often cited by state departments of transportation as a key case study when casting about for ways to fill the chasm between state infrastructure needs and revenues. Though hopeful about the prospects for the mileage fee, state analysts tend to overplay certain policy concerns already resolved, easily resolvable or that depend on how a legislature structures the mileage fee rates.[73]
This report, along with the earlier legislative reports, addresses the bulk of these issues.

Moving from an earlier "wait and see" stance, articles now delve into the details of the "promise and hurdles" of road user fees, with communications to achieve public acceptance most prominent.[74] As reviewers learn more details, the Oregon Concept receives ever greater consideration as an authentic funding alternative incorporating the best features of available policy alternatives and technology options and a practical phased implementation process. These features appeal to an assortment of states and nations with a variety of existing tax structures, demographic trends and geographic contexts.

The Oregon example shows that the replacement of the current car taxation regime has long-term structural causes, with a tax regime change towards a car road user charge occurring, or being seriously considered, in societies as contrasting as a rural state in the USA, the Netherlands, Switzerland and the UK.[75]

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70 *John Horsley,* Improving the Performance of the Surface Transportation System: Revenue Options*, testimony before the National Surface Transportation Policy and Revenue Study Commission, March 19, 2007.*

71 *A. Reno and J.R. Stowers,* The Fuel Tax and Alternatives for Transportation Funding, Special Report 285*, Transportation Research Board, 2006, p. 64. The authors point out areas of convergence and divergence between evaluation criteria used by ODOT and a list proposed by the National Cooperative Highway Research Program (NCHRP) that was based on review of tax studies (mostly from the 1980s). The report notes that Oregon fails to include efficiency explicitly as a criterion.*

72 *Caroline Lundquist Noblet, et al.,* Sustainable Transportation Funding for Maine's Future*, Maine Department of Transportation, January 2006, p. 15. Available at http://www.cutlerhealth.umaine.edu/mcsc/reports/Sustainable%20Transportation%20Funding%20Jan%2006.pdf*

73 *Ibid. Kenneth R. Buckeye.* Mileage-based User Fee White Paper*, Minnesota Department of Transportation, March 2007.*

74 Panelists see Mileage Fees in Minnesota's Long-Term Future*, University of Minnesota Center for Transportation Studies Report, June 2007. Available at http://www.cts.umn.edu/Publications/CTSReport/2007/06/MileageFees.html.*

75 *Stephen Potter, et al.,* European Perspectives on a New Fiscal Framework for Transport*,* The Open Universitys*, p. 10.*

Alabama researchers used Oregon's program as a proxy model, called a vehicle mileage road user fee (VMRUF), in their analysis of state road funding and finance options. While ultimately recommending short term fixes, Alabama researchers recommended additional study of the per-mile charge and opined that implementation of such a system "should be given great attention by government officials, financial analysts and the public, because it has the best potential for the future."[76] Nevertheless, not all reviewers believe the Oregon model would work for their particular situation. Predominantly rural states question whether the strategic element geared to deal with urban congestion will prove appropriate for them. Other states wait to see what happens in Oregon, Iowa and Washington, DC, even as they acknowledge the need for alternative revenue strategies.

## Information Sharing and Policy Debate

Through dialogue with other DOTs, MPOs and state legislatures, ODOT regularly receives expressions of appreciation for willingness to tackle the alternative funding issue head on and for the state's perseverance through initial resistance and difficulties. This "icebreaker" role comes with benefits—because as other states head in complementary research directions, their results will assist Oregon's next round of program development. Other important studies, such as recently conducted by the Puget Sound Regional Council and a multi-state effort led by University of Iowa professor David Forkenbrock, examine an alternative implementation model using utility-style bills as the payment mechanism.[77] ODOT and the task force welcome the opportunity to learn from states actively engaging this problem.

## State versus national implementation

The states face the important question of whether state or regional explorations can realistically lead to broad scale implementation at all or whether a national, consistent

approach must be established at the outset. Many state leaders opt to yield to the federal government, citing the need for the transition to mileage fees to take place on a national level.[78] American Association of State Highway and Transportation Officials' (AASHTO) John Horsley testified before the National Surface Transportation Policy and Revenue Study Commission[79] about the desirability of a national consensus that would translate into only one, uniform change for motorists. To assist in the transition to a new mileage fee collection system, the federal government must take a critical role in establishing national standards for automakers with respect to the requisite technology for collection of distance-based fees and providing development capital for state experiments and implementations.

76 *Virginia P. Sisiopiku., et al.* Alternate Financing for Alabama Highways. *University Transportation Center for Alabama,* UTCA Report Number 05114*, August 2006. Available at http://utca.eng.ua.edu/projects/final_reports/05114fnl.pdf.*

77 *The Road User Fee Task Force considered a monthly utility bill as early as September 2002 and ultimately opted to develop and test the more motorist convenient pay-at-the-pump method.*

78 *Minnesota Lt. Governor Carol Molnau responded to a keynote presentation by ODOT's James Whitty, noting that an eventual solution will need to include Canada and Mexico as well.*

79 *Horsley,* Improving the Performance of the Surface Transportation System*, 2007.*

CHAPTER 8

# The Critical Pathway to Implementation

While the Road User Fee Pilot Program results validate the Oregon Mileage Fee Concept as a legitimate alternative to the gas tax, more development work needs to be done prior to broad scale implementation. Further, key political support must be obtained as well as public consent. This chapter outlines the critical path and timeline for statewide and perhaps national implementation.

## The critical pathway to implementation

The critical pathway to national, regional or statewide implementation includes additional research and technology refinement, public acceptance, and industry acceptance.

### ADDITIONAL RESEARCH AND TECHNOLOGY REFINEMENT

Additional development and testing must take place to prepare for statewide or national implementation. These additional measures include improving customer experience at the pump, resolving multi-jurisdictional issues and other issues associated with broad scale implementation, updating cost estimates and congestion pricing integration. The next phase includes an operational test, simulating a multi-state mileage fee and an integrated and interoperable congestion pricing system.

Throughout the development of the pilot program, ODOT identified a number of comparatively minor, but still important, issues for resolution prior to statewide implementation of the Oregon Concept. If funded, ODOT will work with national partners including a large hardware and software developer, Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO), the US Treasury, the petroleum retail industry, the Society of Automotive Engineers (SAE), various state agencies, and automobile manufacturers toward the following objectives:

**Improving the experience at the pump.**

- Improve the short range communications between the vehicle and the pump for greater accuracy in associating the vehicle with the appropriate fuel pump.
- Reduce point-of-sale cash transaction time at the pump.
- Identify additional possible customer service benefits for consumers at the fueling stations using planned technology.
- Address concerns of the fuel distribution industry, including ensuring minimal service disruption while refueling and protection of proprietary data.

**Resolving issues associated with broad scale implementation.**

- Study socio-economic effects of broad scale implementation, including effects associated with alternative mileage fee rate structures.
- Work with the auto manufacturing industry to develop functional specifications for integrated on-vehicle equipment and test vehicles, including ensuring the security of the on-vehicle devices.
- Conduct a multi-state simulation operational test including motorists, equipped vehicles and service stations.
- Integrate with existing national standards bodies and Vehicle Infrastructure Integration (VII) efforts.
- Develop a method to define and load dynamic multiple taxing districts into on-vehicle devices for concurrent taxing at the federal, state, county and municipal levels.
- Develop new standards for communication between fueling stations and taxing authorities.
- Demonstrate a system for automatic electronic adjustment of geographic zones and rate tables.
- Develop a national or regional tax collection clearinghouse(s) and revenue distribution system concept.

*ODOT expects that prior to obtaining public acceptance, extensive communications must occur with the motoring public. The public must come to understand the problem addressed and accept the need to resolve the problem before they will accept the Oregon Mileage Fee Concept, or any other broad scale change, as a solution.*

*State Senator Bruce Starr, Lila Leathers-Fitz, ODOT Director Matthew Garrett, US Secretary of Transportation Mary Peters.*

- Test a concept for collecting mileage fees from vehicles that fuel/recharge at home through the existing utility meter and billing system.

**Developing firm cost estimates for broad scale implementation.**

- Define costs associated with meeting national technology standards.
- Estimate development and production costs to auto manufacturers and consumers to implement on-vehicle devices as original equipment.
- Refine cost estimates for retrofitting existing vehicles (although not intended for early implementation).
- Refine administrative cost estimates for fee collection and system maintenance and training.
- Refine cost estimates for service station equipment and operations.

**Congestion pricing integration.**

- Explore possibilities for using the Oregon Concept to collect tolls and current and future congestion pricing strategy alternatives.
- Develop a concept for congestion pricing implementation in conjunction with technology phase in. (Note: this may involve either interoperability with existing congestion pricing technology applications or development and introduction of motorist chosen road pricing plans that discourage driving during peak periods).

## PUBLIC ACCEPTANCE

ODOT is under no illusion that the general public is ready for implementation of any form of mileage charges on either a local, state or national basis. ODOT expects that prior to obtaining public acceptance, extensive communications must occur with the motoring public. The public must come to understand the problem addressed and accept the need to resolve the problem before they will accept the Oregon Mileage Fee Concept, or any other broad scale change, as a solution. They must also understand how privacy is protected and how fairness can be built into the rate structure. It may well be that the problem of declining revenues may have to become blatantly obvious before the motoring public will be willing to undertake a dialogue leading to a solution. ODOT believes it makes no sense to wait to prepare a solution until that willingness emerges.

There is room for optimism that public consent can be obtained. Although a self chosen group, the overwhelming bulk of pilot program participants—many of whom began with dubious feelings about this manner of collecting road charges—became supporters of the program. While obtaining this acceptance by the participant motorists required a thorough dialogue and a growing familiarity with the new system, the result provides reason for hope that a communications pathway leading to understanding by the general motoring public can be found.

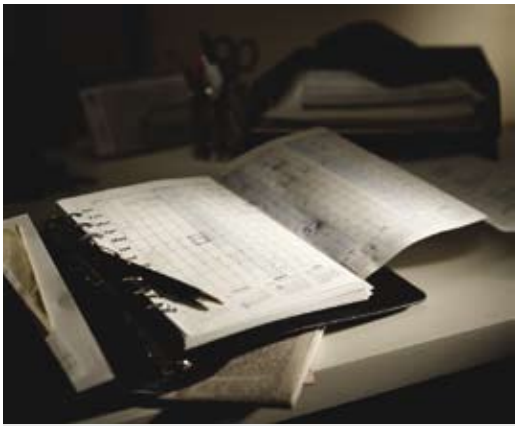
Examining history, as well, gives reason for optimism. The motoring public in Oregon has accepted huge change in road funding many times before. Oregon's original gas tax adopted in 1919 was a big change from the ad valorem taxes used for road funding in the second decade of the 20th century. Oregon's adoption of the weight-distance taxes in 1933 for heavy trucks was a similar sea change. Most recently, the Oregon Legislature tripled gas taxes during the period from 1983 through 1993. The impetus for this huge gas tax increase over multiple legislative sessions was recovery of a 40 percent decline in real Highway Fund purchasing power because of high inflation from 1972-1982 and oil embargoes that caused motorists to purchase lighter, more fuel efficient vehicles in large numbers. The motoring public understood the problem and allowed the legislature to act not just once, but several times.

#### INDUSTRY ACCEPTANCE

Consent obtained from affected industries is also crucial to commencement of broad scale implementation of the Oregon Concept. Automobile manufacturers hold the key to on-vehicle device installation. Fuel retailers must accept new electronic transactions and station equipment in order for this system to be implemented. Broad scale implementation of the Oregon Mileage Fee Concept requires the willing involvement of these industries and their cooperation must be pursued and nurtured.

### Development of legislation

At some point prior to broad scale implementation, legislation must be developed. This undertaking will be intensive with many policy integrations to sort through and many small but important technical issues to address.



For example, a legislature must establish where on the continuum privacy protection policies will be established, recognizing that the ability to audit or challenge a billing will be affected. Penalties for hacking, tampering with or blocking the signals from the on-vehicle devices must also be developed. There will be many other issues to resolve as well, such as how mileage generated by off-road use within Oregon shall not pay the mileage fee.[80]

The most critical issue for resolution involves the rate structure. While the task force directed the pilot program to test a flat rate structure, the possibilities for different rate structures are nearly endless. The electronic platform developed for the Oregon Mileage Fee Concept can easily be modified to accommodate policy directives of a legislature. Chapter 9 discusses these issues in greater detail.

### Timeline for broad scale implementation

The various forms of mileage charge systems under examination in the United States are not quite ready for broad scale implementation on a local, state or national basis. Necessary technology refinements for the on-vehicle devices and fuel pump collections, as well as revenue systems integration, may take up to five years to complete development after allocation of sufficient funding. Without the lead of the USDOT or the State of California, industry acceptance, manufacturing integration and service station installations may take over 10 years. Public acceptance is the wild card. Without effective and consistent messaging by officeholders and other policymakers across the nation, the experience of disasters may be necessary for the public to accept the change to per-mile charges.

In the absence of a large, widely supported effort, broad scale implementation might be feasible in 10 to 12 years, on a phased basis. Since retrofitting is not yet viable, a phased implementation would be necessary as only new vehicles would contain the required technology. Complete implementation under this scenario—meaning application to every vehicle, without retrofitting—would thus

80 *This off-road mileage will likely be resolved the same way the current Oregon gas tax collection system does, by providing a reimbursement application method.*

*Quicker timelines for implementation can become realistic if the necessary resources, political support and political will coalesce.*

occur over a 30 to 35 year period, from start to finish. Development of a feasible retrofitting application would shorten the phasing period but not the development under this scenario.

A small state, acting alone, would likely find it extremely difficult to enact and implement the Oregon Mileage Fee Concept on this timeline. The difficulty of obtaining the cooperation of automobile manufacturers and the gasoline industry and identifying the necessary funding for technology and systems refinements and public communications severely limits the ability of a single, small state implementation. A consortium of small states, however, might find this timeline doable.

Quicker timelines for implementation can become realistic if the necessary resources, political support and political will coalesce. Short term implementation scenarios and immediate implementation scenarios are suggested in Chapter 9.

### A LONG, DELIBERATE DEVELOPMENT AND IMPLEMENTATION SCENARIO

Under the long term scenario, implementation could be phased in over the next several decades, with specific milestones in each of the following three time periods:

**2008 to 2013—Development.** The near-term phase would focus on further development of the system. This would include technical refinement of the applicable technologies, including improving the on-vehicle equipment, refining the electronic association between the vehicle and fuel pump, wireless updates, anti-hacking methodologies and adoption of policies for enforcement, security and protection of privacy.

Also during this period, specifications for equipment—on-board technologies, service stations, point-of-sale, and short range communication—would be developed. Once developed, federal mandates on specifications might be required to ensure the required equipment is either included in all new vehicles during manufacturing or could be added prior to sale in order to ease implementation when the system is ready. A regional revenue collection system would be developed for allocation of federal, state and municipal mileage and congestion fee revenues.

This period would likely include a large-scale pilot with several states implementing the concept on a statewide level. During this period it will also be necessary to build public acceptance of the concept. This will include establishing understanding of the problem the nation is facing with declining gas tax revenues and why the mileage fee is the best solution. It will also include educating the public on the equity issues related to paying for the transportation system, and ensuring protection of privacy to the extent required by a substantial percentage of the motoring public.

**2013 to 2030—Statewide implementation phase-in.** Implementation of the concept on a broad scale level would likely begin in the mid-term, with new vehicles paying the mileage fee and older vehicles paying the gas tax. By 2030, more than 80 percent of the vehicles would be on the new system. With sufficient planning and technology development, retrofitting of older vehicles with the necessary mileage fee technology may prove feasible for application.

**2030 to 2040—Complete implementation.** In the long-term, without retrofitting, the new system would be fully implemented, with 99 percent of vehicles on the new system by 2040. At that point, the Oregon concept for congestion pricing becomes a software issue, and easily implemented. Complete implementation could be achieved years earlier with a limited retrofitting program.

CHAPTER 9

# Public Acceptance and the Big Issues for Broad Scale Implementation

Moving to a new fee or tax system to support any governmental activity will always be difficult. Most people resist change and do not like taxes. Citizens do accept change and taxes, however, when public officials and public policy advocates communicate the need for them and the public agrees the need must be addressed.

Public officials will soon be able to make the case that the gas tax no longer meets its originally intended purpose of adequately funding our road system. When public officials and public policy advocates give this message effectively, the moment for state legislative or Congressional adoption of a mileage fee will have arrived. This is the pathway to public acceptance of the mileage fee, whether the Oregon version or some other version.

Waiting for the time when the general motoring public actually *supports* the change to mileage fees may be too much to ask. Even so, the motoring public may at some critical juncture come to sufficient understanding that they will *consent* to a new road user charging system as the only feasible alternative to fuel taxes that no longer support our road system. Obtaining this public consent will be necessary before any mileage fee system can ever be adopted and put into operation in Oregon or somewhere else in the United States.

## The big concerns of the motoring public

ODOT's six years communicating with the motoring public yielded a unique understanding of the big issues that public policymakers must adequately address before public consent for a mileage fee system can be achieved. The task force and ODOT fashioned the Oregon Mileage Fee Concept to address these big issues. We believe we have either resolved these issues or they can be resolved through legislative policy decisions. Many people continue to have the impression, however, that these issues are still, at best, an open question and, at worse, a fundamental flaw. The key to getting public consent, therefore, continues to be effective communication.

The following are the most cited issues mentioned by the public and the media. Some people argue their point from one particular perspective without consideration of other perspectives. Others who examine questions from more than one perspective tend to provide inquiries rather than arguments.

### PROTECTING PRIVACY

Privacy is the number one concern for many people. They do not want their movements tracked nor have a driving history available to anyone. Many people voluntarily surrender their personal data to the private sector on a regular basis in the form of insurance inquiries, credit card transactions and use of cellular phones, but worry about sharing the same information with the government. In fact, some people do not want *anyone* to obtain personal information about them and tend to have the most visceral reaction to perceived invasions of privacy.

As noted in Chapter 2, ODOT designed the Oregon Mileage Fee Concept to provide the highest protection of privacy available while still providing a way to identify tax cheats and allow a method for the fee paying motorist to challenge a billing. While the Oregon Concept involves the use of a GPS receiver to delineate

*There are ways to design a GPS-based mileage counting system that avoids invasion of privacy, and the Oregon Concept does precisely that.*

zones, ODOT designed this use not to send an identifying signal out from the on-vehicle device to mark real time travel. Thus, no one would have the ability to track a vehicle's movements while it was underway or parked. ODOT also designed the on-vehicle device not to retain any travel history. No one, therefore, with a search warrant or court order could obtain that travel history because no travel history exists.

The only compromise to privacy for the Oregon Concept involves ODOT obtaining the identification of the vehicle, the gasoline amount purchased and mileage totals in each zone during refueling. There are ways to design a mileage fee collection system at the pump without providing any of this data[81] but severe compromises to ODOT's ability to enforce fee payment would have to be made. Still, a legislative body could make this choice.

ODOT believes the Oregon Concept is much closer on the privacy continuum to complete protection of privacy than to complete invasion of privacy.[82] ODOT surmises that many opponents of the use of GPS for mileage charges equate the Oregon Concept with other GPS-based experiments that have occurred or will occur that use GPS to obtain far greater data than possible under the Oregon system. ODOT's point is that use of GPS does not necessarily equal invasion of privacy. There are ways to design a GPS-based mileage counting system that avoids invasion of privacy, and the Oregon Concept does precisely that.

Many opponents of using GPS signals for road user charging argue that this is the first step towards complete government acquisition of private travel data. Oregon's design avoids that potential as well. In the Oregon system, private companies create the on-vehicle devices, automobile manufacturers or dealers install the devices, service stations extract the necessary data for mileage charging and the private sector maintains and repairs the devices. The Oregon system does not give the state government access to the on-vehicle devices except, perhaps, to investigate device tampering (depending upon how much enforcement authority the state legislature provides). Nor does this system give the federal government any involvement whatsoever in state mileage fee collection. When ODOT explains its efforts to protect citizen privacy, most citizens release their anxiety but with the caveat, "As long as it's true!" Once the bulk of the citizenry becomes comfortable with current commercially available on-vehicle navigation units that use GPS technology (and which are far more invasive than the GPS receiver technology employed in the pilot program), the general motoring public's concern with application of GPS receiver technology to collect mileage fees should melt away.

Despite ODOT's care in building protection of privacy into the Oregon Mileage Fee Concept and in communicating our efforts to protect privacy, a small segment of the public still believes their privacy will be at risk. It may be that they misunderstand GPS technology or have an electronics phobia but, in essence, they simply mistrust government on this issue and will always oppose an electronically collected mileage fee. These constrained views should not be reason to abandon an electronic approach to mileage fee collection. Nonetheless, these opponents must be respected, both as individuals and as a key variable in the political calculus during consideration of mileage fee adoption.

### RATE EQUITY

An equally controversial issue for many people involves objection to the flat mileage fee rate tested in the pilot program. Two arguments underlie this objection, one legitimate and the other lacking legitimacy because it is based on an inaccurate assumption. One argument incorrectly assumes that the variance in the

81 *See footnote 3 of Chapter 3 of this report, footnote 10 of this chapter and Whitty,* Report to the 73rd Oregon Legislative Assembly, *2005, p. 34.*

82 *See Appendix I for the privacy continuum.*

weight of passenger vehicles creates a variance in the damages done to the road with the heaviest passenger vehicles doing the most damage. The greater the damage done by a heavier passenger vehicle, the argument goes, means the operator should pay a higher mileage fee rate. While on a microscopic physical level, this may be true; on a cost recovery basis the damage passenger vehicles do to pavement has little variability with no difference at all to the underlying road infrastructure (and the most expensive part of a road to repair).

Heavy trucks cause the greatest damage to the road system with the largest having a weight more than ten times that of the heaviest passenger vehicle. ODOT knows this because of years of road cost responsibility studies performed by ODOT and the Oregon Department of Administrative Services. As a result, Oregon regularly apportions cost for damage to the road system among passenger vehicles and heavy trucks. This analysis and cost allocation will continue whether under the gas tax collection system or under a mileage fee collection system. If at some point, the weight variance for passenger vehicles has a cost recovery effect, Oregon will charge cost allocated rates varied by weight.

The more legitimate argument involves bringing other policy considerations to the analysis of the appropriate mileage fee rate structure. The Oregon Mileage Fee Concept tested a flat rate structure because the Road User Fee Task Force, in keeping with it's legislative mandate, desired to create a system design that considered only road system funding. With roads the only consideration, a flat fee for passenger vehicles makes sense because every car makes nearly precisely the same demand of the road system.

Even so, state legislatures can and do bring other policy considerations to the bill writing table when creating fee and tax rate structures. Among the legitimate policies to consider when creating a mileage fee rate structure include energy use, air quality control, climate change response, resource conservation, growth management and traffic demand management, and, of course, fairness in paying for road capacity expansion. The electronic platform developed for the Oregon Concept allows an almost limitless variation of potential rate structures to accommodate whichever policies a legislature desires. The point is that whether a legislature adopts a flat fee rate or a structured rate of some variation will depend on the policies considered at the time.

*The electronic platform developed for the Oregon Concept allows an almost limitless variation of potential rate structures to accommodate whichever policies a legislature desires.*

The most common issue raised about a flat mileage fee rate structure concerns removal of the incentive for motorists owning gas guzzling vehicles to trade up to fuel efficient vehicles. This point derives from distress about the environmental impact of driving for reasons of climate change and air quality. Considering the mileage fee rate issue from the perspective of environmental sensitivity alone, this point has some validity. Two counter arguments tend to soften the point. First, road charges imposed on vehicles—whether gas taxes or mileage fees—comprise only a minor portion of total fuel costs for operation. This counterpoint argues the change to a flat mileage fee rate would have a negligible impact—cost per mile driven—on vehicle choices. Recent research by Oregon State University provides evidence supporting this point. [83] This argument observes that people trade up for greater fuel efficiency primarily because of fuel cost not tax or fee cost.

The second counterpoint argues for consideration of additional perspectives in creating the mileage fee rate structure, particularly the need for a sustainable road funding source. From the standpoint of establishing good public policy, all compelling policy perspectives should be taken into account when a legislature adopts the rate structure. Even so, the mileage fee rate structure might not be the best place to accommodate every valid policy perspective. A legislature may choose to address the road funding concern in the rate structure while

83 *See Appendix K.*

addressing the environmental concern, or other concerns, in other tax or fee structures that do not directly relate to road funding.

Whatever the legislative preference, it will behoove policymakers to understand that the motivation for development of the Oregon Mileage Fee Concept was to prepare for the day when all new vehicles contain some element of fuel efficiency built into their systems, fuel prices regularly increase and motorists continually trade up to vehicles with greater fuel efficiency. This understanding may lead to a rate structure where at least the leading edge of fuel efficient vehicles pay on a flat rate basis to ensure no revenue erosion from constant fuel efficiency improvements.

As described in Chapter 2, ODOT has considered several rate structure alternatives to the flat rate for encouraging fuel efficiency. Most of these alternatives start with a flat rate for at least the more fuel efficient vehicles in order to ensure road revenues do not erode because of fuel efficiency improvements (like they do now with the gas tax). The alternatives generally involve stacking a second rate on top of the flat rate to allow rate variability for various policy reasons. For example, a fuel inefficiency penalty might be applied to high fuel consuming vehicles in addition to the flat mileage fee rate but still collected at the pump. Another example is to apply the mileage fee to high fuel efficiency vehicles while maintaining the gas tax for low fuel efficiency vehicles.[84]

### FAIRNESS

The issue of fairness crosses several viewpoints. Fairness is indeed in the eye of the beholder. The most common vantage point encountered is fairness as it relates to those operating fuel efficient vehicles. This group argues that because they operate vehicles placing less burden on the environment, they should not be treated the same as those operating vehicles with a larger impact. With the environment the only consideration, this point has validity. When one also considers that each vehicle operator requires the road system to be available when they pull out on to it, then an associated responsibility to pay for the system emerges and the point loses merit. Equality of demand directly corresponds to equality of payment for that demand. This is the rationale for creation of a user pays system.

Another side of the fairness issue relates to whether the system will treat every fee payer the same or whether some technically savvy people will be able to hack into the technology and modify it to their advantage. For reasons of lack of budget and time, security was not a critical developmental element for the pilot program. Nevertheless, ODOT intends that security will be a central focus in the next round of technological development. Before deployment statewide, the technology should be sufficiently secure to ensure equal treatment for all fee payers and sustainability of mileage fee revenues.

A third perspective on the fairness issue relates to whether rural motorists should receive different treatment from urban motorists. This argument claims that rural motorists drive more than urban motorists and do not have readily available mass transit alternatives. Therefore, the argument proceeds, rural motorists should either not be subject to a per-mile charge or

84 *See Appendix L for graphic illustrations of a flat mileage fee, a stacked fuel consumption penalty and a retained gas tax structure for fuel inefficient vehicles.*

receive a break in the mileage fee rate. In essence, the argument is that rural motorists deserve a subsidy. This line of thinking opposes one of the task force's foundational criteria in developing an alternative to the gas tax—that the roads should be funded on a user pays basis.

Recent research conducted by Oregon State University (OSU), in coordination with ODOT, disputes the assumption that rural motorists drive significantly more miles urban motorists.[85]

The OSU research indicates that while rural motorists may drive longer distances for some purposes, there is not more than a 10 percent differential between the overall rural driving compared with urban driving. This would not seem to justify a different mileage fee rate for rural motorists. Additionally, granting a discounted mileage fee rate for lack of transit alternatives only has relevancy when non-road public polices are brought into consideration. From a road-only perspective, the task force's view is that whoever places additional burden on the roads should pay for that added burden.

Advocates for a rural subsidy should determine whether the mileage fee system might work to their advantage. The OSU research indicates that the rural fleet comprises far more trucks and SUVs with lower fuel efficiency than the smaller vehicles that tends to comprise the urban fleet. If the legislature were to adopt a flat mileage fee rate structure, then rural motorists that drive larger, less fuel efficient vehicles would get an advantage compared to the gas tax amounts paid today. If a penalty were added for driving inefficient vehicles, however, rural driving may end up costing the same or more than today's payments of the gas tax.

Whatever the eventual mileage fee rate structure adopted, the difference in amount paid may not be worth the cost of advocating for different structures. The reason is that the burden of road charges—whether gas taxes or mileage fees—simply are not all that high on a per-vehicle basis. The average passenger vehicle driving 12,000 miles per year only pays $12 in state gas tax per month and would pay about the same in mileage fees at a comparable flat mileage fee rate of 1.2 cents per mile. A vehicle getting 40 miles per-gallon for 12,000 miles pays only $6 in state gas tax per month and would pay $12 in mileage fees at a comparable flat rate. A vehicle getting 10 miles per-gallon for 12,000 miles pays $24 in state gas taxes per month and would pay $12 in mileage fees at a comparable flat rate. There would be winners and losers with a flat rate structure but what would be won and lost is not much. Still, fairness matters for many and should be given strong consideration in creating the ultimate mileage fee rate structure.

### TECHNOLOGY RELIABILITY

Some members of the general motoring public express concerns about various aspects of the technology employed under the Oregon Concept, particularly reliability, accuracy and security. For the simple fact that the Oregon Concept creates electronic collection of state revenue, this portion of the public reasonably worries whether they will be forced to struggle with technology employed and whether the new system will produce fairness. They want assurance that ODOT will easily resolve any hiccups without customer frustration.

The task force and ODOT have similar concerns about the reliability and accuracy of the technology to be employed. ODOT does not expect Oregon transportation policymakers to proceed with adoption of the electronic collection of mileage fees in any fashion without the highest level of assurance of technological reliability and accuracy. This is why in the next steps of technology development, described in Chapter 8, ODOT intends to engage world class technology firms to develop the technology proposed for the Oregon Concept to the point of commercial viability. When errors inevitably surface, however, ODOT agrees that the agency should develop simple ways to accommodate their resolution in a customer-friendly manner.

### COST

Some people assume the Oregon Concept will cost far too much to implement and operate. Actually, cost control was one of the central goals in developing the Oregon Concept. ODOT developed the collection at the fuel pump method to avoid the massive capital and operational costs associated with centralized mileage fee collection.[86]

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85 *B. Starr McMullen and Lei Zhang,* Social-Economic Impact of a Vehicle Mileage Tax, *Oregon State University and ODOT Research August 1, 2007.*

86 *More detail on this analysis is provided in Chapters 2 and 5 (see Evaluation criteria 2: Cost) and Whitty,* Report to the 72nd Oregon Legislative Assembly, *2003, pp. 31, W-Z.*

To recap the conclusions, the estimated $33 million in capital costs for statewide implementation of the Oregon Concept could be bonded over a 20 year period and result in less than a two percent increase in the mileage fee rate. Operations costs—essentially for auditing—would be about the same as for the gas tax. The Oregon Mileage Fee Concept could be implemented and operated statewide affordably.

The prototype on-vehicle devices used in the pilot program are too expensive for statewide implementation. The cost of these prototypes included development costs borne by very few devices and retrofit installation costs which would not occur with statewide implementation. Produced on a mass production basis, commercialized on-vehicle devices should be affordably embedded into the purchase price of new passenger vehicles.

### COMPLEXITY

The bailout argument, when all other arguments have been countered, is that the new system would simply be too complex. They argue that if gas tax revenues shrink because of fuel efficiency improvements, then, "Why not simply raise the gas tax?" Underneath this argument appears to lie a reluctance to change.

When compared with other commercial transactions in today's world, the Oregon Mileage Fee Concept is fairly simple. Credit or debit card transactions, Internet purchases, phone calls (either mobile or land line) and basic utility services are as complicated, or more so, than the mileage fee collection method tested in the pilot program. Those other transactions, however, were developed outside the public eye. There is a price to pay for transparency but from the beginning the task force and ODOT decided to pay it. Full disclosure of policy rationale, system developments, results and future intentions were always readily available to the general public, whether residents of Oregon, other states or any nation in the world with access to the Internet.

Why not simply raise the gas tax? Quite simply, relying on the ability of future legislatures to raise the gas tax will not provide sustainable revenues for the road system. It is exceedingly difficult politically to raise the gas tax when the price of gasoline is also rising. Voters tend not to support imposition of additional financial burdens on themselves during times of economic uncertainty. With the price of gasoline expected to continually rise as demand grows while supply subsides in future years, a state legislature would have to raise the gas tax nearly every year to keep up with falling revenues. Rarely has any state been able to regularly increase gas tax revenues to account for inflation, so it is reasonable to expect the same political reluctance to raise gas tax revenues on account of fuel efficiency improvements. Even with regular increases in the gas tax rate, it is unlikely that legislatures would be able to raise it quickly enough to keep up with inflation and fuel efficiency improvements. Gas tax increases will always be behind the curve. Oregon and the nation need a new road revenue system directly related to road use that will not erode with fuel efficiency improvements. If the new system also provided an escalator for inflation, Oregon's road funding question would essentially be answered.

A companion argument asks, "Why don't we simply put an escalator on the gas tax?" In the United States, only one state[87] has a substantial—though not sufficient—escalator for inflation attached to their gas tax. Many states have attempted legislation to establish an inflation escalator for the gas tax, but failed. In essence, the answer is that such a solution has proven politically impracticable in the United States.

There is a second societal reason why providing an escalator may not be the most desirable policy for the gas tax. The motoring public is currently in the process of moving to more fuel efficient vehicles to reduce the cost of driving

87 *Florida*

and to provide some security for future uncertain gasoline prices. Unlike the 1970s (when the motoring public switched to lighter vehicles in response to the increase in gasoline prices resulting from the OPEC oil embargo), the new round of long-range, fuel efficient vehicle purchases will be technology based—new drive trains, new materials, new fuels. These new vehicles will be purchased largely by more affluent members of society. The less affluent members of our society will tend to purchase older vehicles in the secondary market—the minivans, SUVs and trucks of today.

The evidence is currently apparent. Today's used SUV quickly falls in price while a Prius retains much of its value.[88] As gasoline prices continue to rise, the market will respond with new, ever-more-fuel-efficient vehicles and this phenomenon will continue. The pertinent question becomes, "Do we as a society want to place the bulk of the burden for funding our road system on the poorer element of society?" This consideration argues against regular gas tax increases as a long term solution to the nation's road funding dilemma.

### ANOTHER TAX

Early opponents of the Oregon Mileage Fee Concept opposed creation of a "new tax." They presumed the basic mileage fee would be another charge on the public in addition to the gas tax. While it is true a legislature has the power to make the mileage fee a new, added charge, the legislative mission provided the task force in 2001 could not be more clear—"to develop a design for revenue collection for Oregon's roads and highways that will *replace* the current system (emphasis added)."[89]

As explained many times and in many places from the very beginning, the task force and ODOT designed the basic mileage fee as a replacement for a soon-to-fail gas tax. As such, the basic mileage fee should not be tagged as an added tax as a matter of course. Congestion charges, on the other hand, could be an additional revenue source. Nevertheless, the legislature would likely consider the basic mileage fee and congestion charging as separate policy questions with the options of enacting the basic mileage fee either with or without congestion charging (or with or without local option as well) depending upon policy preferences.

## The big policy questions

ODOT has had the good fortune of direct communications about the Road User Fee Pilot Program with national policy making bodies such as the National Surface Transportation Policy and Revenue Study Commission, the National Surface Transportation Infrastructure Financing Commission, staff from the United States Department of Transportation and representatives from various state policy making bodies across the United States. ODOT has also had extensive discussions with policy makers for the American Association for State Highway Transportation Officials and the Transportation Research Board's Study Committee on the Long-Term Viability of the Gas Tax.

Numerous implementation issues have come forth during these interactions and ODOT provided the answers given earlier in this report. Even so, not every big policy question comes forth during each engagement. It is therefore incumbent upon ODOT to describe our views, intentions and plans with regard to the big questions not mentioned previously in this report.

### NON-LIQUID FUEL VEHICLES

While over 99 percent of the passenger vehicle fleet currently uses some type of liquid fuel and therefore could pay the per-mile charge via the Oregon pay-at-the-pump method, there is a strong possibility that a significant portion of newer vehicles soon to enter the marketplace will not operate on liquid fuels. While even fuel cell vehicles have to fuel up every so often, the short-range all-electric vehicle might become a ubiquitous alternative over time for commuting in urban areas. It is obvious that collection at the fuel pump would not accommodate mileage fee payment by operators of all-electric vehicles. A valid question is then asked, "How would the all-electric vehicle pay the mileage fee under the Oregon program?"

There are three systemic options for all-electric vehicles to pay the mileage fee. The first option, probably most viable, involves uploading mileage fee data wirelessly through electric utility meters

88 *For instance, a review of the April 2007 edition of* Consumer Reports *magazine indicated one year old Toyota Priuses sell for more than the MSRP of new Priuses. In contrast, one year old SUVs generally sell for a substantial discount to their MSRPs.*

89 *See Appendix A for House Bill 3946 (2001).*

for billing via the monthly electric bill. The upload could occur in the proximity of any electric meter but the vehicle identification would direct the mileage fee to the proper account for billing. Thus, this mileage fee system would have the same operational advantages of fueling at the fuel pump—cost savings from tapping into an existing billing system and ease of use for the motorist who pays the electric bill as before but with the mileage charges added to the bill.

A second option, perhaps somewhat less desirable, would involve cellular uploads of mileage fee data to centralized data and billing centers. Centralized collection may be much more feasible when starting with a small population of vehicles. The immense capital and operating costs that would be necessary for full fleet billing can be minimized when only a few, but growing, number of vehicles require this method of billing. Essentially, the centralized system can grow with the all-electric vehicle fleet over time. Still, centralized collection will always be more expensive to implement and operate than attaching to an already existing billing or taxing system.

A third option would upload mileage data and collect the fee at the time of vehicle re-registration. Collection-at-registration is infeasible for broad scale implementation to all vehicles because the infrequency of re-registrations[90] and the avoidance of re-registration by a significant number of motorists would negatively impact revenue levels. The registration system might be adjustable to accommodate collection from motorists operating all-electric vehicles especially if done on a nationwide basis.

### DYNAMIC PRICING

The optimum application of congestion pricing for management of traffic levels involves immediate rate changes in response to traffic conditions. The Oregon model was not designed for dynamic pricing and, indeed, the use of only GPS-receivers—without expensive in-vehicle navigation and roadside communication systems—does not facilitate immediate price changes for specific facilities. The Oregon model does accommodate price changes of rather recent vintage.

Some US policymakers favor the German system for mileage charging of heavy trucks because it allows for dynamic pricing. The German

government, however, has good reasons for not applying this system to passenger vehicles. The German system is quite expensive to implement and operate, requires a high level of invasiveness of a motorist's driving habits and is not easy for a consumer to use. Furthermore, dynamic pricing broadly applied across a road system would make it impossible for the typical commuter to manage his or her budget, and more difficult to plan his or her day. In creating the Oregon model, ODOT designed away from these characteristics in order to have a more likely chance of garnering public acceptance.

### TRAVEL DATA ACQUISITION

Departments of transportation tend to persistently seek higher quality travel data to enable better transportation planning and traffic management systems. While the Oregon Mileage Fee Concept protects against involuntary creation and transfer of such data for reasons of privacy, there is nothing that prohibits a department of transportation from asking a certain valid population sample of motorists to volunteer to have their driving habits monitored to gather this data. To participate, these motorists would have to consent to have a continuous transmission device installed in their vehicle. A DOT would likely offer a price break on the mileage fee to attract the appropriate sample size.

### SOCIO-ECONOMIC EFFECTS

The societal effect of charging per-mile or charging congestion fees have received little

90 *Oregon state law, for example, requires vehicle re-registration every two to four years.*

attention to date. The OSU research study begins this analysis. Further study of the sociological effects of mileage charging may well be required before a legislature would consider statewide or national implementation of a mileage fee charging system. ODOT intends to direct such studies once funding is identified.

## How quickly could implementation occur with enough support?

In about 10 to 15 years the state's gas tax revenues will enter permanent decline.[91] While this crisis is only a few short years off, the pain of lost revenues has already begun. Motorists now purchase greater numbers of fuel efficient vehicles in response to increasing gas prices over the past few years. This trend will continue and further exacerbate the revenue situation years before gas tax revenues reach the point of permanent decline year after year.

Oregon and the nation should implement a solution as soon as possible to avert this decline. This section proposes a short term implementation scenario and an immediate term implementation scenario, both intended as alternatives to the longer, more deliberate timeline described in Chapter 8. The feasibility of the three timelines depends primarily upon the adequacy of assigned resources and political support. Technical "know how" is not the limiting factor for broad scale implementation.

### SHORT TERM IMPLEMENTATION SCENARIO

The steps toward short term implementation of the Oregon Mileage Fee Concept would essentially be the same as for the longer, more deliberate timeline outlined in Chapter 8 but quicker because of greater development commitment from powerful governmental entities. If Oregon or any single state acts with the support of the United States Department of Transportation or in concert with the State of California, a vigorous and well funded effort could result in implementation of the Oregon Mileage Fee Concept in *three to five years*.

This short term scenario would require allocation of up to $20 million in technology and systems development funding for refining the mileage fee technology tested in the pilot program to the level of commercial viability. This would enable hiring the assistance of world class software and hardware expertise to concurrently develop the hardware, software and systems required for implementation to commercial viability in collaboration with the automobile manufacturers and gasoline retail industry.

Several other development tracts would proceed concurrently. A well funded public communications plan will be necessary to ensure appropriate public understanding of the problem addressed, the solution proposed and the details of implementation. Further, hired contractors would deploy system tests to provide assurance of 99.99 percent reliability and accuracy for the mileage fee collection equipment.

State legislative or Congressional enactments will be necessary to require automobile manufacturers to install secure, on-vehicle mileage counting devices in new vehicles models, establish enforcement processes and require service stations to install mileage reading equipment, modify their point-of-sale (POS) systems to accommodate charging a mileage fee and provide a credit for the gas tax, and communicate with a DOT central database.

### IMMEDIATE TERM IMPLEMENTATION SCENARIO

Mileage fee collection could commence in two to three years after enactment if Oregon

91 *See graph predicting revenue decline in Whitty,* Report to the 73rd Oregon Legislative Assembly, *2005, pp. 7-21.*

*Oregon is unlikely to implement the Oregon Mileage Fee Concept alone.*

or any other government implements—as an interim measure—automatic vehicle identification (AVI) tag technology embedded with a vehicle's USEPA emission rating to calculate and collect an estimated mileage fee technology at the fuel pump.[92] This is the most feasible scenario for a single state adoption of a mileage fee collection system.

Under this scenario, a single state identifies a relatively small amount of funding for redevelopment of electronic AVI-based license plates to include an EPA fuel efficiency rating that would transmit this information through AVI recognition technology into the point-of-sale system at service stations. Legislative authorization would be required for widespread distribution of the electronic AVI-tags, enforcement processes, and for a mandate for readers of electronic AVI-tags at service stations, and modification of service station POS systems to allow imposition of mileage fees in replacement of the gas tax.

## Final thoughts

ODOT designed the pay-at-the-pump model for affordability, protection of privacy to a high level and ease of motorist use. As far as we know, the Oregon model is the only one addressing all three of these critical considerations. Other per-mile charge systems have exotic features but, in ODOT's view, none are as likely to win public acceptance as Oregon's.

Despite our care in designing for public acceptance, Oregon is unlikely to implement the Oregon Mileage Fee Concept alone. Refining the necessary technology requires investment of multiple millions of dollars. Embedding on-vehicle technology into new passenger vehicles requires the acceptance and cooperation of the world's politically influential automobile manufacturers. Applying collection equipment at service stations requires the acceptance and cooperation of the also influential gasoline distribution industry. In order to accomplish these things, Oregon must obtain the support of the federal government, join a consortium of states or work in partnership with a very large state with huge market influence such as California.

The timeline to broad scale implementation of the Oregon Mileage Fee Concept can be short or long, depending upon the commitment of resources and political will. With a severe road revenue shortfall looming and transportation policymakers across the nation now motivated for systemic change, the moment has ripened for assembling the necessary resources and political will to implement a solution over a relatively short time frame. This nation has met large scale challenges before and succeeded in solving them quickly. A nation that put a man on the moon in less than a decade can surely find a way to implement a system of mileage-based fees in a much shorter period of time.

92 *Under this methodology—known as Scenario 4 in Whitty,* Report to the 72nd Oregon Legislative Assembly, *2003, p.M-1—a DOT would outfit each resident passenger vehicle with a license plate that contains an AVI tag embedded with a fuel efficiency rating established by the United States Government. When a vehicle refuels, the vehicle identification and fuel efficiency rating would be read electronically at the fuel pump. This "reading" would occur in much the same manner as a modern all-electronic tolling system and similar to the vehicle identification demonstrated during the Road User Fee Pilot Program (RUFPP). The mileage fee would be determined through application of a fee rate to an estimate of vehicle miles traveled determined as a function of the amount of gasoline purchased and the fuel efficiency rating of the vehicle. There would be no need for data transfer to a centralized computer system as no mileage data would be developed. Mileage fee calculations would occur within the point-of-sale systems at the fueling stations in a manner similar to that which occurred during Road User Fee Pilot Program but central processing of data would be unnecessary. Out of state motorists and non-equipped vehicles would pay the fuel tax.*

*One large advantage to this method is complete protection of privacy in that ODOT would never have access to where any vehicle had fueled nor have access to mileage data for any time period. The primary disadvantage is that electronic zones could not be created for payment on only Oregon miles nor to facilitate inexpensive collection of local option mileage fees and the area pricing methodology for congestion pricing. Even so, the AVI tag could be designed for interoperability with certain electronic tolling systems currently used for congestion pricing and tolling on stand-alone facilities.*

# Glossary of Terms and Appendices

# GLOSSARY OF TERMS

**AASHTO** American Association of State Highway and Transportation Officials.

**AVI** Automatic Vehicle Identification. Transponders, or tags, used to collect specified information on a particular vehicle.

**Congestion Pricing** Congestion pricing (also referred to as peak period pricing, road user charging or value pricing) assesses the owner/operator of a motor vehicle a charge for using certain roadways during periods of high congestion.

**Control Phase** The period of time during the first five months of the Oregon Road User Fee Pilot Program also referred to as the baseline phase. The participants' vehicles were outfitted with on-vehicle devices to count and categorize miles driven. During this phase participants paid the gas tax—not a mileage fee—to provide baseline data for the study.

**COTS** Commercial-Off-The-Shelf. A term used to describe software or hardware that is ready-made and available for sale, lease, or license to the general public.

**DSL** Digital Subscriber Line. A term used to describe digital data transmission over the wires of a local telephone network.

**DSRC** Dedicated Short Range Communications. A short to medium range wireless protocol specifically designed for automotive use. It offers communication between the vehicle and roadside equipment. It is a sub-set of the RFID-technology. This technology for ITS applications is working in the 5.9 GHz band (U.S.)

**FHWA** Federal Highway Administration

**Field Test** A term used to describe the active portion of Oregon's Road User Fee Pilot Program where participants actually drove with the equipment in their cars and fueled at the two designated fueling stations outfitted with mileage reading equipment.

**Gas/Fuel Tax** A fuel tax is an excise tax paid per-gallon, rather than a percentage of sale price, that covers a broad category of fuels, including gasoline, but also diesel, various forms of natural gas, propane etc. The gas tax is quite simply a fuel tax on gasoline. Each fuel has its own tax rate.

**GHz** Gigahertz. One GHz represents 1 billion cycles per second.

**GIS** Geographic Information System. A system for capturing, storing, analyzing and managing data and associated attributes which are spatially referenced to the earth.

**GPS** Global Positioning System. A system utilizing at least 24 orbiting satellites managed by the US Air Force that transmits precise microwave signals, enabling a GPS receiver to determine its location, speed, direction, and time.

**ITS** Intelligent Transportation System. A worldwide initiative to add information and communications technology to transportation infrastructure and vehicles aiming to manage traffic, safety and fuel consumption.

**Mileage Fee** A per mile charge.

**NCHRP** National Cooperative Highway Research Program. Created by the Transportation Research Board in 1962 as a means to conduct research in acute problem areas that affect highway planning, design, construction, operation, and maintenance nationwide.

**OBD** On-Board Diagnostics. A generic term referring to a vehicle's self-diagnostic and reporting capability. OBD systems give the vehicle owner or a repair technician access to state of health information for various vehicle sub-systems.

**ODOT** Oregon Department of Transportation

**OPA** Oregon Petroleum Association

**Oregon Mileage Fee Concept** A distance-traveled charge (also known as VMT fee or per-mile charge) imposed according to the amount a vehicle uses the road system and collected while fueling at gas stations.

**OSU** Oregon State University

**POS** Point-of-Sale. The hardware and software used for checkouts, the equivalent of an electronic cash register. Point-of-sale systems are used in gas stations as well as almost any type of retail establishment.

**PSU** Portland State University

**RF** Radio Frequency. A frequency or rate of oscillation within the range of about 3 Hz and 300 GHz commonly used for wireless communications.

**RFID** Radio-Frequency Identification. An automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders. An RFID tag is an object that can be applied to or incorporated into a product, animal, or person for the purpose of identification using radio waves. Some tags can be read from several miles away and beyond the line of sight of the reader.

**RUFPP** Road User Fee Pilot Program. A year-long pilot program conducted in 2006-2007 to test the Oregon Mileage Fee Concept using 260 volunteer drivers and two gas stations in Portland, Oregon.

**RUFTF** Road User Fee Task Force. A 12-member group created by the 2001 Oregon Legislature charged with designing a new revenue collection strategy that could replace the gas tax with a long-term, stable source of funding.

**Rush Hour Group** A group of volunteers in Oregon's Road User Fee Pilot Program who paid a varied rate per mile charge, depending on time of day. If traveling in the rush hour time zone, they paid 10 cents per mile, but travel during any other time period was at a reduced per mile charge of .043 cents per mile.

**Rush Hour Zone** A zone in Oregon's Road User Fee Pilot Program defined by the Urban Growth Boundary in the Portland Metropolitan area and the specified times; 7-9 AM and 4-6 PM Monday through Friday, excluding holidays.

**Task Force** *See the Road User Fee Task Force.*

**Test Phase** The period of time during the second five months of the Oregon Road User Fee Pilot Program field test also referred to as the experimental phase. The participants were divided into three different groups; control, VMT and rush hour. The VMT and rush hour participants ceased paying the gas tax and began paying mileage fees at the pump.

**True-Up** A periodic reconciliation between ODOT and the service station retailer.

**USDOT** United States Department of Transportation

**VII** Vehicle Infrastructure Integration. An initiative fostering research and applications development for a series of technologies directly linking road vehicles to their physical surroundings, first and foremost in order to improve road safety. The technology draws on several disciplines, including transport engineering, electrical engineering, automotive engineering, and computer science. VII specifically covers road transport although similar technologies are in place or under development for other modes of transport.

**VMRUF** Vehicle Mileage Road User Fee. Alabama's name for a per-mile fee.

**VMT** Vehicle Miles Traveled. A common term used to describe road use.

**VMTCAR** Vehicle Miles Traveled Collected at Retail. A concept developed by the Oregon Department of Transportation that collects a mileage fee at retail gas stations.

**VMT Group** Vehicle Mile Tax Group. A group of volunteers in Oregon's Road User Fee Pilot Program who paid a flat per mile rate of 1.2 cents per mile for all travel in the Portland Metropolitan area.

# Appendix A

71st OREGON LEGISLATIVE ASSEMBLY--2001 Regular Session

## Enrolled

# House Bill 3946

Sponsored by Representatives KRUMMEL, STARR, Senator GEORGE; Representatives DEVLIN, MORRISETTE, NELSON, ROSENBAUM, VERGER

CHAPTER .....

AN ACT

Relating to alternatives to motor vehicle fuel taxes; and prescribing an effective date.

**Be It Enacted by the People of the State of Oregon:**

**SECTION 1. The Legislative Assembly finds that:**

**(1) An efficient transportation system is critical for Oregon's economy and quality of life.**

**(2) The revenues currently available for highways and local roads are inadequate to preserve and maintain existing infrastructure and to provide funds for improvements that would reduce congestion and improve service.**

**(3) The gas tax will become a less effective mechanism for meeting Oregon's long-term revenue needs because:**

**(a) It will steadily generate less revenue as cars become more fuel-efficient and alternative sources of fuel are identified; and**

**(b) Bundling fees for roads and highways into the gas tax makes it difficult for users to understand the amount they are paying for roads and highways.**

**SECTION 2. (1) There is created the Road User Fee Task Force.**

**(2) The purpose of the task force is to develop a design for revenue collection for Oregon's roads and highways that will replace the current system for revenue collection. The task force shall consider all potential revenue sources.**

**(3) The task force shall consist of 12 members, as follows:**

**(a) Two members shall be members of the House of Representatives, appointed by the Speaker of the House of Representatives.**

**(b) Two members shall be members of the Senate, appointed by the President of the Senate.**

**(c) Four members shall be appointed by the Governor, the Speaker and the President acting jointly. In making appointments under this paragraph, the appointing authorities shall consider individuals who are representative of the telecommunications industry, of highway user groups, of the Oregon transportation research community and of national research and policy-making bodies such as the Transportation Research Board and the American Association of State Highway and Transportation Officials.**

**(d) One member shall be an elected city official, appointed by the Governor, the Speaker and the President acting jointly.**

**(e) One member shall be an elected county official, appointed by the Governor, the Speaker and the President acting jointly.**

**(f) Two members shall be members of the Oregon Transportation Commission, appointed by the chairperson of the commission.**

**(4)(a) The term of a legislator appointed to the task force is four years except that the legislator ceases to be a member of the task force when the legislator ceases to be a legislator. A legislator may be reappointed to the task force.**

**(b) The term of a member of the task force appointed under subsection (3)(c) of this section is four years and the member may be reappointed.**

**(c) The term of a member of the task force appointed under subsection (3)(d) or (e) of this section is four years except that the member ceases to be a member of the task force when the member ceases to be a city or county elected official. A city or county elected official may be reappointed to the task force.**

**(d) The term of a member of the Oregon Transportation Commission appointed to the task force is four years except that the member ceases to be a member of the task force when the member ceases to be a member of the commission. A member of the commission may be reappointed to the task force.**

**(5) A legislator appointed to the task force is entitled to per diem and other expense payments as authorized by ORS 171.072 from funds appropriated to the Legislative Assembly. Other members of the task force are entitled to compensation and expenses as provided in ORS 292.495.**

**(6) The Department of Transportation shall provide staff to the task force.**

**(7) The task force shall study alternatives to the current system of taxing highway use through motor vehicle fuel taxes. The task force shall gather public comment on alternative approaches and shall make recommendations to the Department of Transportation and the Oregon Transportation Commission on the design of pilot programs to be used to test alternative approaches. The task force may also make recommendations to the department and the commission on criteria to be used to evaluate pilot programs. The task force may evaluate any pilot program implemented by the department and report the results of the evaluation to the Legislative Assembly, the department and the commission.**

**(8) In addition to the requirements of subsection (9) of this section, the task force shall propose to the Seventy-second Legislative Assembly options for the design of a revenue collection system for Oregon's roads and highways that would replace the current system for revenue collection.**

**(9) The task force shall report to each regular session of the Legislative Assembly on the work of the task force, the department and the commission in designing, implementing and evaluating pilot programs.**

**(10) Official action by the task force requires the approval of a majority of the members of the task force.**

**(11) Notwithstanding ORS 171.130 and 171.133, the task force by official action may recommend legislation. Legislation recommended by the task force must indicate that it is introduced at the request of the task force. Legislative measures proposed by the task force shall be prepared in time for presession filing with the Legislative Counsel by December 15 of the year preceding a regular session of the Legislative Assembly.**

**SECTION 3. (1) The Department of Transportation may develop one or more pilot programs to test alternatives to the current system of taxing highway use through motor vehicle fuel taxes. Pilot programs may include, but need not be limited to, programs testing technology and methods for:**

**(a) Identifying vehicles;**

**(b) Collecting and reporting the number of miles traveled by a particular vehicle; and**

**(c) Receiving payments from participants in pilot projects.**

**(2) Technology and methods tested under subsection (1) of this section shall be tested for:**

**(a) Reliability;**

**(b) Ease of use;**

**(c) Public acceptance;**

**(d) Cost of implementation and administration; and**

**(e) Potential for evasion of accurate reporting.**

**(3) The department may solicit volunteers for participation in pilot programs developed under this section. A participant must:**

**(a) Report the participant's use of the highway system in Oregon as required by the program;**

**(b) Pay the fee established for the program for use of the highway system; and**

**(c) Display in the participant's vehicle an emblem issued under subsection (6) of this section.**

**(4) The department shall establish a fee for each pilot program the department undertakes. The fee shall be a highway use fee and shall be paid by each participant in the program. The program may be designed so that the fee is imposed in lieu of any tax on motor vehicle fuel imposed under ORS 319.020 or any tax on the use of fuel in a vehicle under ORS 319.530 that would otherwise be paid by the participant.**

**(5) If a person who participates in a pilot program under this section pays the motor vehicle fuel tax under ORS 319.020, the department may refund the taxes paid.**

**(6) The department shall issue an emblem for each vehicle that will be used by a participant as part of a pilot program under this section. A seller of fuel for use in a motor vehicle may not collect the tax that would otherwise be due under ORS 319.530 from a person operating a vehicle for which an emblem has been issued under this subsection.**

**(7) If a person participating in a pilot program under this section ends the person's participation in the program prior to termination of the program, the person shall pay to the department any amount of the highway use fee established for the program under subsection (4) of this section that the person has not yet paid. The person shall return to the department any emblem issued to the person under subsection (6) of this section.**

**(8) The department may terminate a pilot program at any time and may terminate participation by any particular person at any time. When a program is terminated or a person's participation is terminated by the department, the department shall collect any unpaid highway use fees established for the program under subsection (4) of this section.**

**(9) The department may adopt any rules the department deems necessary for the implementation of this section, including but not limited to rules establishing methods of collecting highway use fees from program participants and rules establishing reporting requirements for participants.**

**(10) The department may compensate participants in pilot programs established under this section.**

**(11) In designing, implementing and evaluating pilot programs under this section, the department shall consider the recommendations of the task force created by section 2 of this 2001 Act.**

**SECTION 4. (1) The department may use moneys in the State Highway Fund for financing activities required to support the task force created by section 2 of this 2001 Act and the pilot programs established under section 3 of this 2001 Act.**

**(2) The department may solicit and accept grants and assistance from the United States Government and its agencies and from any other source, public or private.**

**(3) The department may accept gifts or donations of equipment necessary to carry out research and pilot programs under sections 2 and 3 of this 2001 Act.**

**SECTION 5. (1) Notwithstanding section 2 (8) of this 2001 Act, not later than September 30, 2002, the task force created by section 2 of this 2001 Act shall present a preliminary report to the Legislative Assembly on possible alternatives to the current system of taxing highway use through motor vehicle fuel taxes.**

**(2) Not later than July 1, 2003, the Department of Transportation shall begin to implement pilot programs as authorized by section 3 of this 2001 Act.**

**SECTION 6.** **Sections 1 to 5 of this 2001 Act are repealed on January 2, 2010.**

**SECTION 7.** **This 2001 Act takes effect on the 91st day after the date on which the regular session of the Seventy-first Legislative Assembly adjourns sine die.**

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**Passed by House June 30, 2001**

.....
Chief Clerk of House

.....
Speaker of House

**Passed by Senate July 3, 2001**

.....
President of Senate

**Received by Governor:**

.....M.,....., 2001

**Approved:**

.....M.,....., 2001

.....
Governor

**Filed in Office of Secretary of State:**

.....M.,....., 2001

.....
Secretary of State

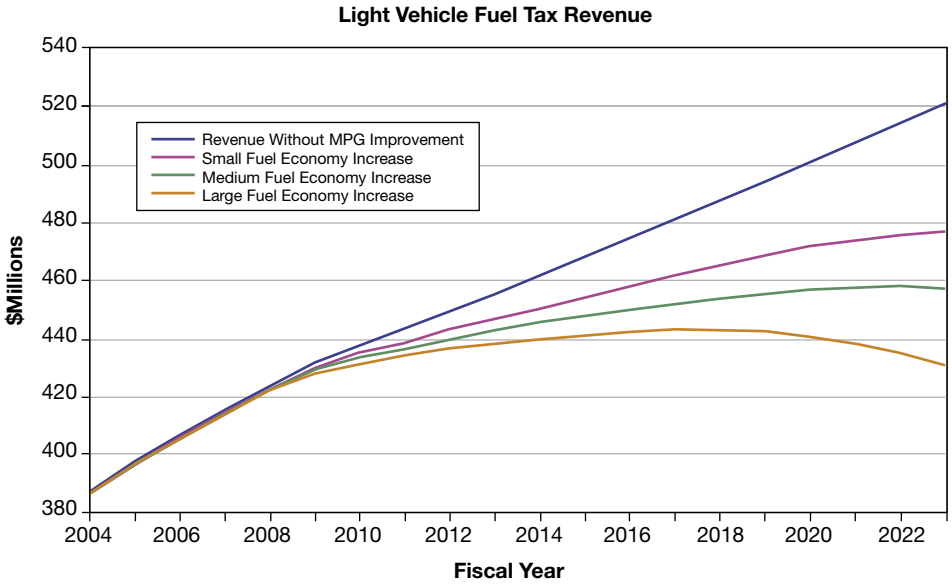
# Appendix B

## OREGON ROAD USER FEE TASK FORCE MEMBERS, 2001–PRESENT

| Name | Title | Appointed |
|---|---|---|
| Bruce Starr, Chair | Oregon State Senator | November 2001–present |
| Joanne Verger | Oregon State Senator | November 2001–present |
| Chuck Burley | Oregon State Representative | August 2003–present |
| Terry Beyer | Oregon State Representative | August 2003–present |
| Laura Pryor | Judge, Gilliam County | November 2001–present |
| John Watt | Oregon Highway Users Alliance | November 2001–present |
| Pat Egan | Vice President, Paficicorp | February 2005–present |
| John Charles | President, Cascade Policy Institute | November 2001–present |
| Dr. Chris Bell | Assoc. Dean, OSU College of Engineering | November 2001–present |
| Randy Papé | Oregon Transportation Commissioner | November 2001 – present |
| Mike Nelson | Oregon Transportation Commissioner | September 2004–present |
| Gary George | Oregon State Senator | November 2001–August 2004 |
| Alan Brown | Oregon State Representative | February 2003–August 2003 |
| Peter Courtney | Oregon State Senator | August 2004–November 2005 |
| Susan Castillo | Oregon State Senator | November 2001–January 2003 |
| Jim Torrey | Mayor, City of Eugene | November 2001–November 2005 |
| Roger Hinshaw | President, Bank of America | November 2001–September 2004 |
| John Russell | Oregon Transportation Commissioner | November 2001–September 2004 |

# Appendix C

## POTENTIAL IMPACTS OF FUEL EFFICIENCY INCREASES & ALTERNATIVE FUEL VEHICLES ON OREGON GASOLINE TAX REVENUE (2004-2023)




*Source: Oregon Department of Transportation Financial Services (April 2005)*

# Appendix D

MEMO

July 1, 2002

To: Jim Whitty, Administrator
Road User Fee Task Force

From: Quintin Hess, Manager
Fuels Tax Group

Re: Taxing Gasoline at the Pump

You have requested a memo outlining the issues involved in moving the taxation point of gasoline in Oregon from the distributor level to the retail level, i.e. the pump. [Note: This memo does not address issues pertaining to collection of VMT fees at the pump.] We have identified a number of issues that should be taken into consideration before proposing such a change.

1. **Increased ODOT Audit Presence**. No other states tax gasoline at the retail level and haven't in the recent past. Consequently, data isn't available to study/forecast the impact of such a move by ODOT. Many states have however, moved the taxation point up the distribution chain. In virtually all cases, the states have enjoyed an increase in revenues, although in some cases the increase has been temporary due to evasion schemes subsequently developed that have reduced the increase. Moving the taxation point down the distribution chain presents an interesting question. Would the effect be the opposite of what happens when the taxation point is moved up? It is difficult to say, but it would be *critical for ODOT to maintain a strong audit presence and closely monitor revenues* in the event revenue decreases began occurring.

2. **Administration Costs Five or Six Times Greater**. Initial estimates place the cost of administering a retail based tax program in the range of *$5 million to $6 million a year*, and FTE would increase from 15 to a total of 67. *Start up costs could run as high as $1.5 million.* The current program is administered at a cost of approximately $1 million a year.

3. **Increased Taxpayer Error Rate**. Retail stations as a whole would likely make more errors due to *less sophisticated accounting systems and accounting personnel.*

4. **Increased Private Sector Reporting**. In order to 'verify' the total amount of fuel entering the state, it would be *necessary to track fuel from entry into the state, to the ultimate sale.* This is necessary in order to insure that all fuel is being accounted for. This would require *reporting by all levels of the distribution chain as well as by motor carriers hauling bulk fuel.*

5. **Evasion a Higher Percentage of Gas Tax Revenue**. A mitigating factor to this move would be the decreasing reliance on the gas tax as a major source of revenue for ODOT. The portion of ODOT revenue represented by the gas tax will be declining as alternative tax programs are used. Any evasion incurred, while a higher percentage of gas tax revenue, will be a progressively smaller percentage of total revenue.

6. **Unsophisticated Taxpayers**. Moving to the retail level would result in an increase in taxpayers from approximately 200 to 1000. The amount of tax reported would run the gamut and there would be a marked increase in smaller accounts. Initial observation indicates that this smaller segment of the fuel industry *is more susceptible to late payments and business failures* than their larger, more sophisticated suppliers. As such, bad debts would be more numerous but smaller in amount. If this move becomes likely, further analysis should be done to determine an estimate, if possible, of the amount of loss ODOT could expect to experience.

7. **New Computer System Needed**. The change would necessitate a new computer system to handle the increased number of licensees/taxpayers and the radically changed tax structure. Extensive involvement by ODOT's IS staff would be necessary to accurately estimate the cost of developing such a system.

8. **Electronic Data Filing Problematic**. The transmission of data electronically becomes both beneficial and problematic at the retail level. Electronic based filing would reduce data entry costs and the errors that go with it, but the less sophisticated base of taxpayers may be *less accepting of mandated or voluntary electronic filing.*

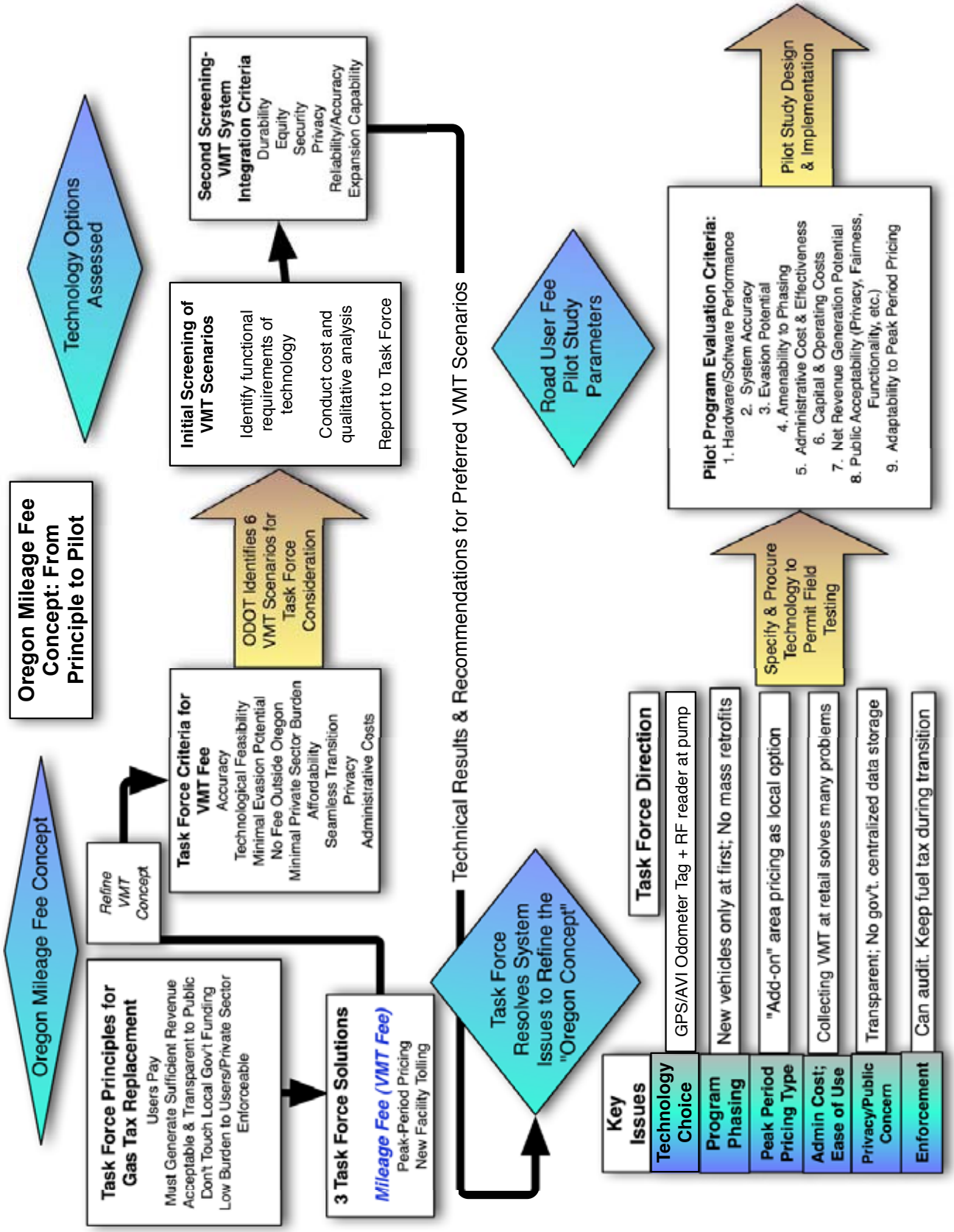
9. **Increased Demand for Governmental Exemptions**. A retail based tax structure could potentially encourage the demand for exemptions by governmental bodies from the federal level down to the local level. Exemptions from the retail based use fuel tax currently exists for virtually all governmental bodies in Oregon. The retail nature of the use fuel tax has contributed to the relative ease of administering the tax program with the exemptions, and *moving the gas tax to the retail level would likely facilitate political pressure to extend the exemptions to the gas tax*. In addition, legal advice would be needed to determine if the state's ability to tax the federal government could be maintained.

10. **Bucks National Uniformity Trend**. Industry buy-in to a retail based tax structure is unknown, but would be critical to it's success. The change would go against a nationwide movement toward uniformity. Multi-state operators would likely be very concerned with the 'uniqueness' of the Oregon system as it *would require a reporting structure* on their end *completely different from any other state*.

11. **Increased Costs to Other Governmental Entities**. ODOT currently administers local tax ordinances for Washington and Multnomah Counties, and the City of Woodburn. The tax structure of these ordinances mirrors existing state law. If the local governments chose not to follow a move to a retail based system, their collection costs would go up as the efficiencies gained by having the same tax structure as the state would be lost. Similarly, the tax structure for aircraft fuels administered for the Department of Aviation is based on a distributor level tax. Further analysis would need to be done to estimate the impact on these other tax programs.

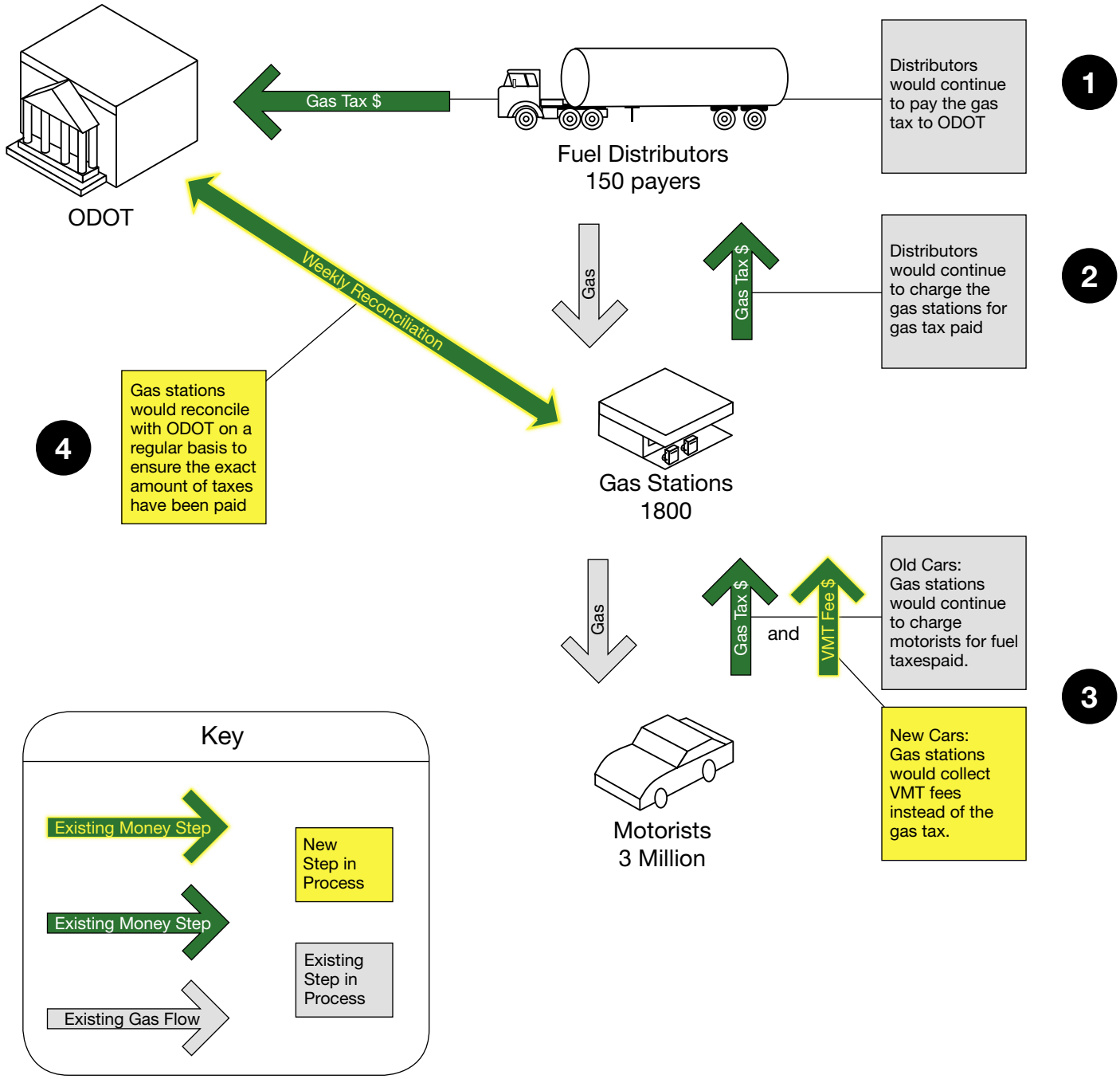
Thanks for the opportunity to provide input to the Road User Fee Task Force. Please feel free to contact me for clarification of any of these points or for further information.

# Appendix E


Oregon Mileage Fee Concept: From Principle to Pilot
Oregon Mileage Fee Concept
Task Force Principles for Gas Tax Replacement
Users Pay
Must Generate Sufficient Revenue
Acceptable & Transparent to Public
Don't Touch Local Gov't Funding
Low Burden to Users/Private Sector
Enforceable
Refine VMT Concept
Task Force Criteria for VMT Fee
Accuracy
Technological Feasibility
Minimal Evasion Potential
No Fee Outside Oregon
Minimal Private Sector Burden
Affordability
Seamless Transition
Privacy
Administrative Costs
3 Task Force Solutions
Mileage Fee (VMT Fee)
Peak-Period Pricing
New Facility Tolling
ODOT Identifies 6 VMT Scenarios for Task Force Consideration
Initial Screening of VMT Scenarios
Identify functional requirements of technology
Conduct cost and qualitative analysis
Report to Task Force
Technology Options Assessed
Second Screening-VMT System Integration Criteria
Durability
Equity
Security
Privacy
Reliability/Accuracy
Expansion Capability
Technical Results & Recommendations for Preferred VMT Scenarios
Task Force Resolves System Issues to Refine the "Oregon Concept"
Road User Fee Pilot Study Parameters
Task Force Direction
Key Issues
Technology Choice
GPS/AVI Odometer Tag + RF reader at pump
Program Phasing
New vehicles only at first; No mass retrofits
Peak Period Pricing Type
"Add-on" area pricing as local option
Admin Cost; Ease of Use
Collecting VMT at retail solves many problems
Privacy/Public Concern
Transparent; No gov't. centralized data storage
Enforcement
Can audit. Keep fuel tax during transition
Specify & Procure Technology to Permit Field Testing
Pilot Program Evaluation Criteria:
1. Hardware/Software Performance
2. System Accuracy
3. Evasion Potential
4. Amenability to Phasing
5. Administrative Cost & Effectiveness
6. Capital & Operating Costs
7. Net Revenue Generation Potential
8. Public Acceptability (Privacy, Fairness, Functionality, etc.)
9. Adaptability to Peak Period Pricing
Pilot Study Design & Implementation

# Appendix F

State Gas Tax and Mileage Fee
Integrated Collection and
True-Up Process



# Appendix G

## ROAD USER FEE PILOT PROGRAM RECRUITMENT PROCESS

### Qualifications

Given the study's terms and the limitations of the technology employed, not all interested people were eligible to participate. ODOT and the consulting team developed a qualification process to screen potential participants and ensure that their participation in the study would be successful. Public involvement materials provided potential volunteers with some information about the study, but the program limitations on technology compatibility required one-on-one questioning with a member of the consultant team to determine likelihood for qualification. These materials directed the public to call the project's recruitment hotline if they believed they might qualify.

### Telephone Screening

Typically, a potential volunteer would phone the hotline expressing an interest in participating in the study and in the financial compensation package that was part of the enticement used to recruit and retain volunteers. The consultant team member would explain the basic framework of the pilot and ask the volunteer questions to determine likelihood of qualification based on the following participant criteria:

- *Make/Model Qualification:* The vehicles in the study must be able to be equipped with the on-board device developed by OSU. The interface (called the OBDII port) through which this device communicated with the vehicle's computer and drew power was standard equipment on *most* vehicles produced between the years 1996 and 2004. Dozens of vehicles at both the beginning and end of this spectrum, however, did not qualify due to either late adoption of the OBDII standard or early adoption of the next generation of connectors. OSU provided the consultant team with a list of non-qualifying vehicles, and the consultant hotline staff queried each potential recruit to ensure vehicle compatibility.
- *Household Participation Qualification:* The characteristics of the personal vehicles of potential participants were not the sole technical qualifier for inclusion in the pilot. Each vehicle in the household had to qualify, based on the make and model standards described above. As the Road User Fee Pilot Program consisted not only of testing technological feasibility, but also driving behavior changes that could result from the mileage fee and the congestion pricing application, participants would be organized into one of three experimental groups at the halfway point of the study. Incentives built into the experiment could induce participants in certain groups to drive less or at different times than in the first half of the study. It was therefore imperative that all vehicles within the household qualify for participation in study, so as not to skew results of the behavioral study through untraceable changes in driving choices. Therefore, households with a non-qualifying gasoline-fueled automobile, a diesel auto or truck (taxation of diesel fuel differs from gasoline), or a motorcycle (incompatible with the study's technology) were excluded from the study. More than any other qualification requirement, the requirement for complete household participation resulted in the disqualification of many potential participants.
- *Willingness to Abide by Study Terms:* If a caller's household qualified from a technical perspective per the above requirements, there remained several requirements for participation that a potential pilot member might be unwilling or unable to agree to. Participants were required to do the following.
    - Attend a one-hour training and information session with ODOT and consultant staff.
    - Agree to have Car Toys install the on-board technology in all household vehicles.
    - Agree to fuel each vehicle no less than twice per month at one or both of the two partner service stations.
    - Agree to drive through an independent mileage reader three times during the course of the study.
    - Agree to participate in three separate behavioral surveys during the course of the study.
    - Sign volunteer agreement.
    - Make a one year commitment to participate in the study.
    - Maintain required insurance on all vehicles in study.
    - Report malfunctions of on-vehicle device.
    - Not to tamper with the on-vehicle device.
    - Notify ODOT of any personal changes (i.e. moving jobs, residences, new car, etc.) as soon as possible.

**Participant Sign-Up**

If callers met the above criteria and remained interested in participating, the hotline operator made an appointment and later confirmed their attendance at one of seven, one hour group training and information sessions. ODOT scheduled those trainings over the course of one month, located generally in the study area (outer SE and NE Portland), at one of two public facilities: a Multnomah County Library branch, and a Portland Parks Department community center facility. Meetings were scheduled on various days of the week and during the evening time in an attempt to accommodate differing work schedules. Pre-screening and confirmation calls, as well as the household participation requirement, helped generate excellent attendance levels, as only one representative from each home needed to attend the session.

The meetings provided ODOT with the first opportunity to address potential participants face-to-face and answer more specifically the questions that arose from attendees. Meetings began with ODOT's brief PowerPoint presentation, demonstrating visually to recruits how the technology functioned and how the study would operate. Presenters displayed a sample model of the on-board technology that would be installed in the vehicles. Furthermore, ODOT staff's personal experience with the pre-pilot test-drive lent authenticity to the training presentations.

Participants filled out all requisite sign-up documentation during these sessions, and ODOT asked that a representative from Car Toys attend each meeting and provide on-the-spot installation appointments. These last two measures were critical to recruitment success, as they limited the need for further meetings or telephone calls to complete registration. Qualified participants walked away from these meetings having signed a volunteer agreement with ODOT and with an installation appointment and participant packet in hand. For copies of the participant packet, please contact ODOT.


*Recruitment Newspaper Advertisement.*

# Appendix H

**Participant Communications Plan**

Because the pilot involved regular citizens who had test equipment installed in their personal vehicles and who were asked to perform specific tasks in order to test the Oregon Concept, regular communication with participants was paramount to ensure full participation and avoid attrition.

ODOT developed a detailed communication plan that set priorities for day-to-day tasks to meet long range goals. The plan described what needed to be accomplished, ways in which those objectives could be accomplished, to whom the communications would be addressed, the timetable for the program, who was going to be responsible for each task, and how ODOT would evaluate the results.

The plan outlined each type of anticipated communication with participants for the duration of the pilot and included written, spoken, and electronic communications.

Specifically, the plan included a series of five pre-recorded messages on a toll free participant message line that provided up-to-date information on the next tasks and timelines to be completed. If the information on the pre-recorded message didn't answer the participant's question, they were encouraged to leave a message and an ODOT team member returned their call within 24 hours.

Six times throughout the pilot, ODOT sent out volunteer update newsletters with important information concerning the study. At the midpoint, each participant received a new packet that detailed changes from the control phase to the test phase.

In addition to mailings, ODOT posted each document on the Road User Fee Web site under a special participant tab that could be easily accessed. Just before major milestones were to take place, ODOT placed pre-recorded reminder calls to each household, which included dates and timelines in which each new task needed to be accomplished.

Besides task reminders, ODOT mailed periodic statements detailing endowment account activity in order for participants in the VMT group or rush hour group to monitor their usage and thereby provided an opportunity to adjust their driving if desired.

As a means to compliment the communications plan, the project team also developed supporting materials that included: a policy briefing packet, web content, a DVD video, a Flash internet video, newspaper ads, news releases, volunteer training, recruitment and notification materials, PowerPoint presentations, and legislative reports. These materials are all available upon request.

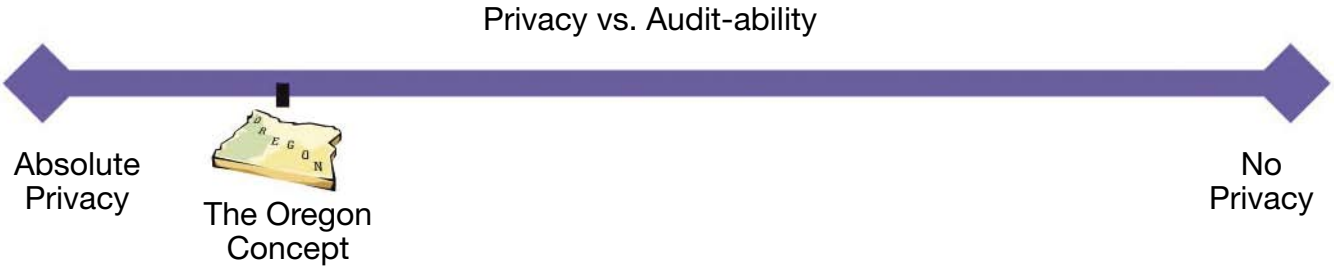
Execution of the communications plan was a success. All forms of communications went out as planned within the designated timeline. Ninety-six percent of the participant volunteers said in a final survey they were happy with the communication from the ODOT project team.

## COMMUNICATION PLAN

| No | Task | Method | Who | Purpose | Date |
|---|---|---|---|---|---|
| 1. | Recruiting | | HDR | Recruit qualified participants | 2/15/06 – 4/30/06 |
| 2. | Training | In person | HDR/Team | Registration | 3/27/06 |
| 3. | Training | In person | HDR/Team | Registration | 4/3/06 |
| 4. | Training | In person | HDR/Team | Registration | 4/4/06 |
| 5. | Training | In person | HDR/Team | Registration | 4/10/06 |
| 6. | Training | In person | HDR/Team | Registration | 4/11/06 |
| 7. | Training | In person | HDR/Team | Registration | 4/18/06 |
| 8. | Training | In person | HDR/Team | Registration | 4/24/06 |
| 9. | Training | In person | | Registration | 4/27/06 |
| 10. | Training | In person | | Registration | 5/8/06 |
| 11. | Training Complete | | | | 5/10/06 |
| 12. | Installation | **REPLY** | CarToys | Schedule install | 4-17-06 – 5/17/06 |
| 13. | Installation | Phone | CarToys | Follow up with no-shows for install | Until complete |
| 14. | Installations complete | | | | 6/14/06 |
| 15. | Compensation | Mail | Jill | Send checks for Installation milestone | 4/24/06 – 6/1/06 |
| 16. | Volunteer notification | Mail/Email | Jill | First reading instructions & reminder | 6/1/06 |
| 17. | First read | | | | 6/16/06 – 6/20/06 |
| 18. | Volunteer notification | Phone | Jill | Reminder - Follow up for no-show | 6/12/06 – 6/23/06 |
| 19. | Compensation | Mail | Jill | Send checks for Read milestone | 6/25/06 |
| 20. | Data Gathering | Phone Call | PSU/Sub | Baseline Survey | 6/20/06 |
| 21. | Mid period newsletter | Mail/email | Jill | | 8/15/06 |
| 22. | Phone Message 1 | Phone | OCE | Mid point read notice | 10/9 |
| 23. | Control list to PSU | Email | Betsy | List of forced Control | 10/9 |
| 24. | PSU develop Groups | | Tony | Control/VMT/Rush Hour | 10/23 |
| 25. | PSU provide list | | | | |
| | to OSU ODOT | Email | Tony | | 10/23 |
| 26. | Phone Message 2 | Phone | OCE | Drive thru Packet coming | 10/23 |
| 27. | Data Gathering | Mail | Jill/Betsy | Notification of group selection, instructions and directions | 10/25/06 |
| 28. | Volunteer notification | Mail/Email | Jill/Betsy | Second reading instructions & reminder | 10/25/06 |
| 29. | Second read | | | | 11/08/06 – 11/12/06 |
| 30. | Phone Message 3 | Phone | OCE | Final drive thru reminder | 11/12/06 |
| 31. | Data Gathering | Phone Call | PSU/Sub | 2nd Survey | 11/12/06 – 11/15/06 |
| 32. | Compensation | Mail | Jill | Send checks for second Read milestone | 11/17/06 |
| 33. | Account Balance | Mail/Email | Darel | Notification of endowment balance & Oregon gas tax receipts received | 12/4/06 |
| 34. | Account Balance | Mail/Email | Darel | Notification of endowment balance & Oregon gas tax receipts received | 12/22/06 |
| 35. | Account Balance | Mail/Email | Darel | Notification of endowment balance & Oregon gas tax receipts received | 1/12/07 |
| 36. | Mid-point newsletter | Mail/email | Jill/ Betsy | | 1/26/07 |
| 37. | Refund | Mail | Jill | Refund gax tax | 1/26/07 |
| 38. | Account Balance | Mail/Email | Darel | Notification of endowment balance & Oregon gas tax receipts received | 1/26/07 |
| 39. | Account Balance | Mail/Email | Darel | Notification of endowment balance & Oregon gas tax receipts received | 2/9/07 |
| 40. | Phone Message 4 | Phone | OCE | Notice of Third Read | 3/6/07 |
| 41. | Account Balance | Mail/Email | Darel | Notification of endowment balance & Oregon gas tax receipts received | 3/9/07 |
| 42. | Uninstall | Mail/Email | Jill/ Betsy | Instructions on how to remove equipment | 3/23/07 |
| 43. | Final read | | | | 3/21/07 – 3/25/07 |
| 44. | Data Gathering | Phone | PSU/Sub | Final Survey | 3/25/07 – 4/10/07 |
| 45. | Uninstall | In person | CarToys | | 3/26/07 – 4/30/07 |
| 46. | Uninstall | Mail/Email | Jill | Reminder for those who have not removed equipment | 4/15/07 |
| 47. | Refund | Mail | Jill | Refund gax tax | 5/1/07 |
| 48. | Compensation | Mail | Jill | Thank you, final compensation & endowment balances | 5/31/07 |

# Appendix I

## The Privacy Continuum




**Absolute Privacy**

No records maintained
No ability to audit
No ability for customer validation

**No Privacy**

Detailed trip data maintained
Full ability to audit
Full ability for customer validation

# Appendix J

## Literature Reviewed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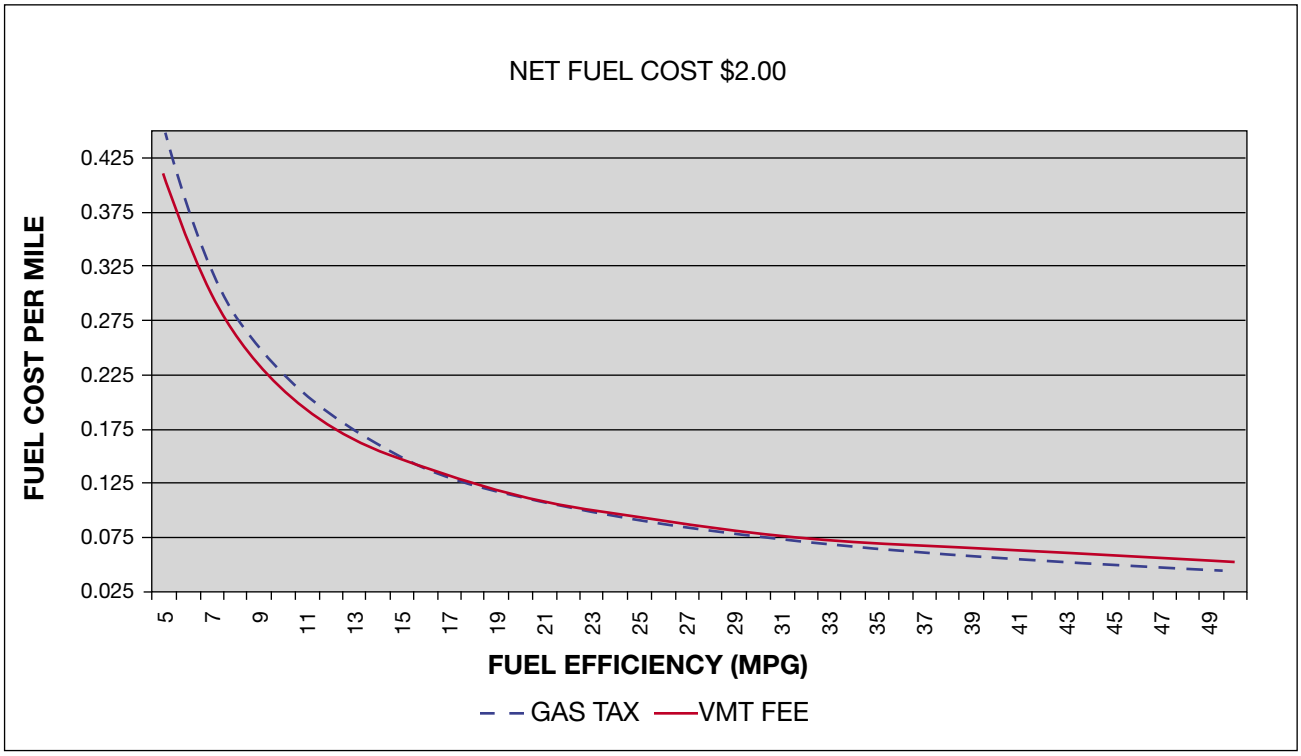
# Appendix K

## Fuel Cost Per Mile Comparison



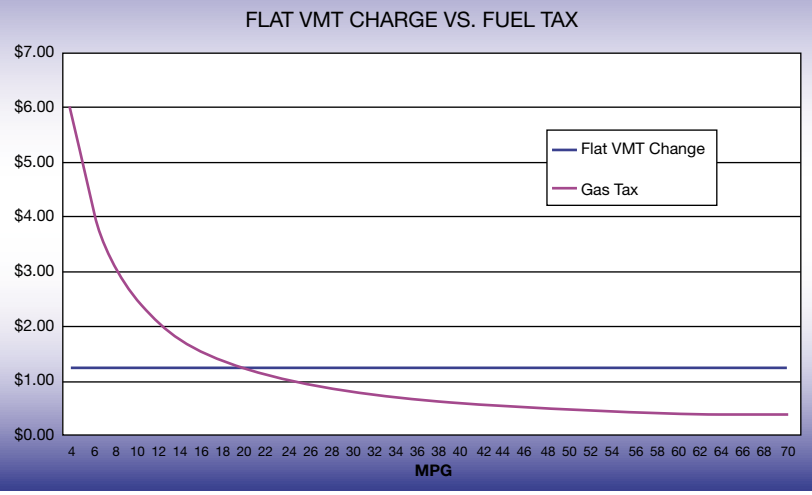

Source: B. Starr McMullen, Lei Zhang, Kyle Nakahara, *Socio-economic Impacts of a Vehicle Mile Tax*

# Appendix L

Oregon Department of Transportation

## Key Policy Issue – The Rate Structure

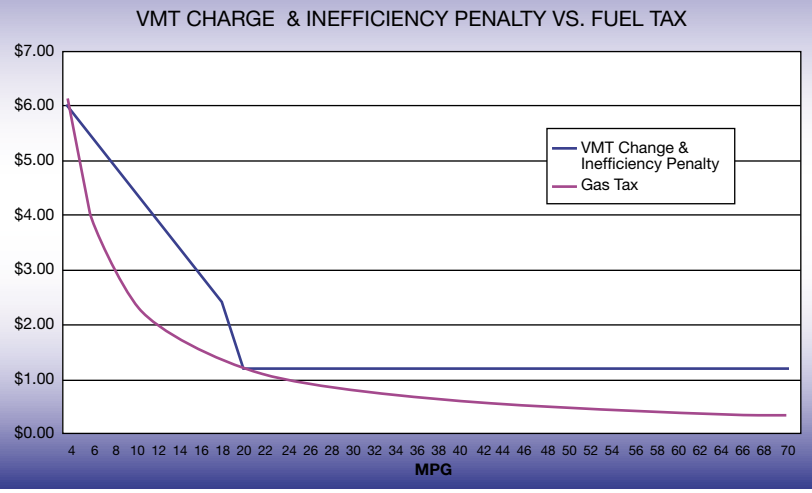
Possibility #1: Flat mileage charge




Oregon Department of Transportation

## Key Policy Issue – The Rate Structure

Possibility #2: Add fuel inefficiency penalty to mileage charge



Oregon Department of Transportation

## Key Policy Issue – The Rate Structure

Possibility #3: Fuel efficient vehicles pay mileage charge & Low fuel efficiency vehicles pay gas tax