



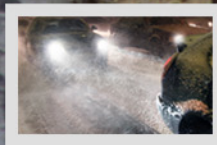
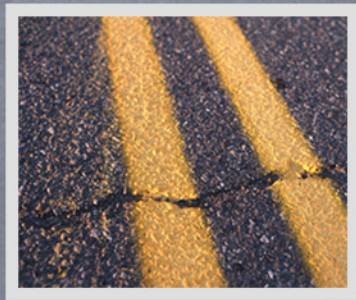
Washington State Road Usage Charge Assessment

*Domestic and International Review and Policy
Context*

Steering Committee #1 Briefing Material

September 13, 2012

Document # 1



Washington State Transportation
Commission



Washington State
Department of Transportation

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Section 1:

Basis for Washington's Examination of a Road Usage Charge

Legislative Directive

The 2012 Regular Session of the 62nd Legislature passed a Supplemental Transportation Budget, providing funding to the Washington State Transportation Commission (WSTC) “solely to determine the feasibility of transitioning from the gas tax to a road user assessment system of paying for transportation.”¹ The Legislature also provided funding to the Washington State Department of Transportation (WSDOT) “solely to carry out work related to assessing the operational feasibility of a road user assessment, including technology, agency administration, multistate and Federal standards, and other necessary elements.”

Both efforts will be conducted under the guidance of a Steering Committee. Required activities include:

- Review relevant reports and data related to models of road usage assessments and methods of transitioning to a road usage assessment system;
 - > Analyze the research to identify issues for policy decisions in Washington;
- Make recommendations for the design of systemwide trials;
- Develop a plan to assess public perspectives and educate the public on the current transportation funding system and options for a new system; and
- Assess technology, agency administration, multistate and Federal standards, and other necessary elements.

Subject to future funding, WSDOT may conduct a limited scope pilot project to test the feasibility of road usage charging for electric vehicles.

No decisions have been reached about whether Washington State will pursue road usage charging. The purpose of this study is to determine whether road usage charging makes sense for Washington, and if so, make recommendations about what next steps should be taken or further studied before any decisions are reached.

¹ Engrossed Substitute House Bill 2190, 62nd Legislature, 2012 Regular Session. Complete text of relevant sections provided in Appendix A.

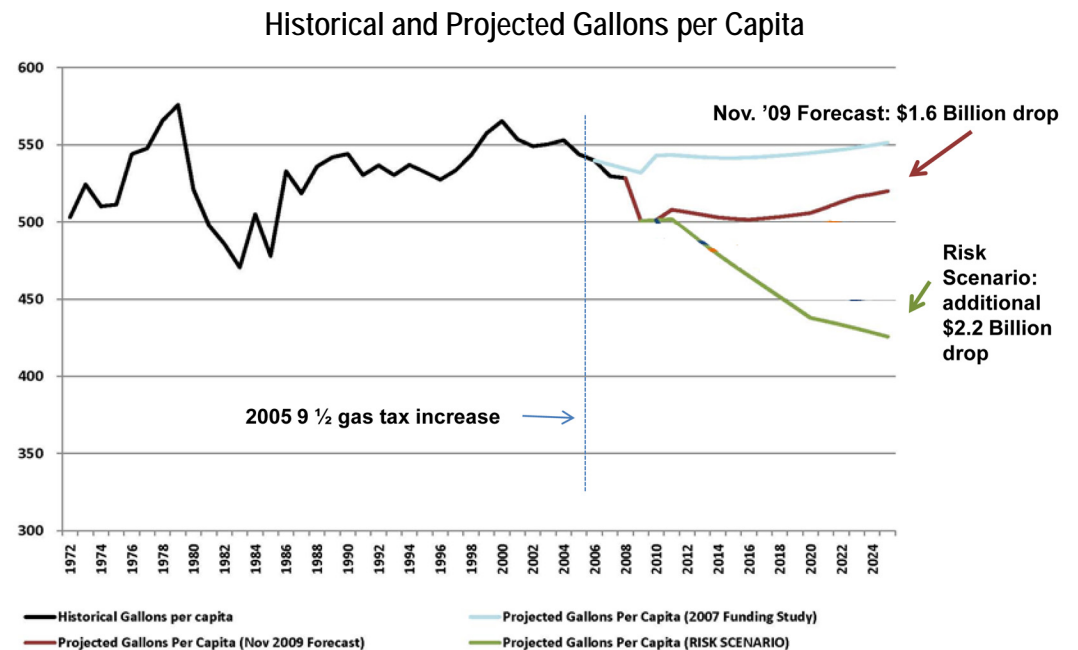
Prior Studies of Transportation Funding Options

This feasibility study builds on previous work and is part of an evolutionary approach to exploring road usage charges in Washington.

2007 – Long-Term Transportation Financing Study. The Joint Transportation Committee studied existing and potential new methods for funding and financing Washington’s transportation needs.

2009 – Implementing Alternative Transportation Funding Methods. The Joint Transportation Committee analyzed the feasibility and practicality of implementing mid-term and long-term transportation funding methods. A “risk scenario” with a future vehicle fleet with much greater than average fuel economy was forecast to result in a revenue shortfall of over \$3.8 billion in Washington’s highway fund over the 16 year horizon. The recently enacted Corporate Average Fuel Economy (CAFE) standards could reduce motor fuel tax revenue even further.

2011 – Connecting Washington. Governor Gregoire’s panel of business and government officials developed a 10-year transportation funding strategy to restore and maintain base levels of transportation services that had seen sharp decreases since 2007 and that would make strategic improvements in Washington’s transportation system targeted at economic growth and job creation. The Task Force recognized “that Federal action would be desirable before the state implements a revenue system based upon vehicle miles traveled. However, we believe Washington should begin to test alternative methods to implement such a system and prepare for the transition to an alternative of that kind.”²



² Connecting Washington Task Force. Connecting Washington. January 6, 2012, pp 27.

Washington State Road Usage Charge Assessment

Approach

- Incrementally increase the Steering Committee's understanding of road usage charging through consultant-prepared reports and discussion at six Steering Committee meetings.

Outcome

January 2013: Steering Committee recommendations to the Legislature and Governor:

- Research and development plan
- Proposed budget for the 2013-2015 fiscal biennium for examining the issue in more depth and/or experimenting with such a system through technology demonstrations, pilot projects or system trials either separately or in conjunction with other states

June 2013:

- Policy Parameters
- Public opinion and consumer acceptance parameters
- Preliminary operational concepts

- There will be no final recommendation as to whether there should be road usage charging in Washington, or what form it would take.
- If the recommendation of the Steering Committee is that road usage charging is feasible, further studies or pilots would be necessary. Only then would the Steering Committee make a recommendation for a specific road usage charge program, if the Steering Committee feels such a recommendation is appropriate.

Steering Committee Schedule and Discussion Topics

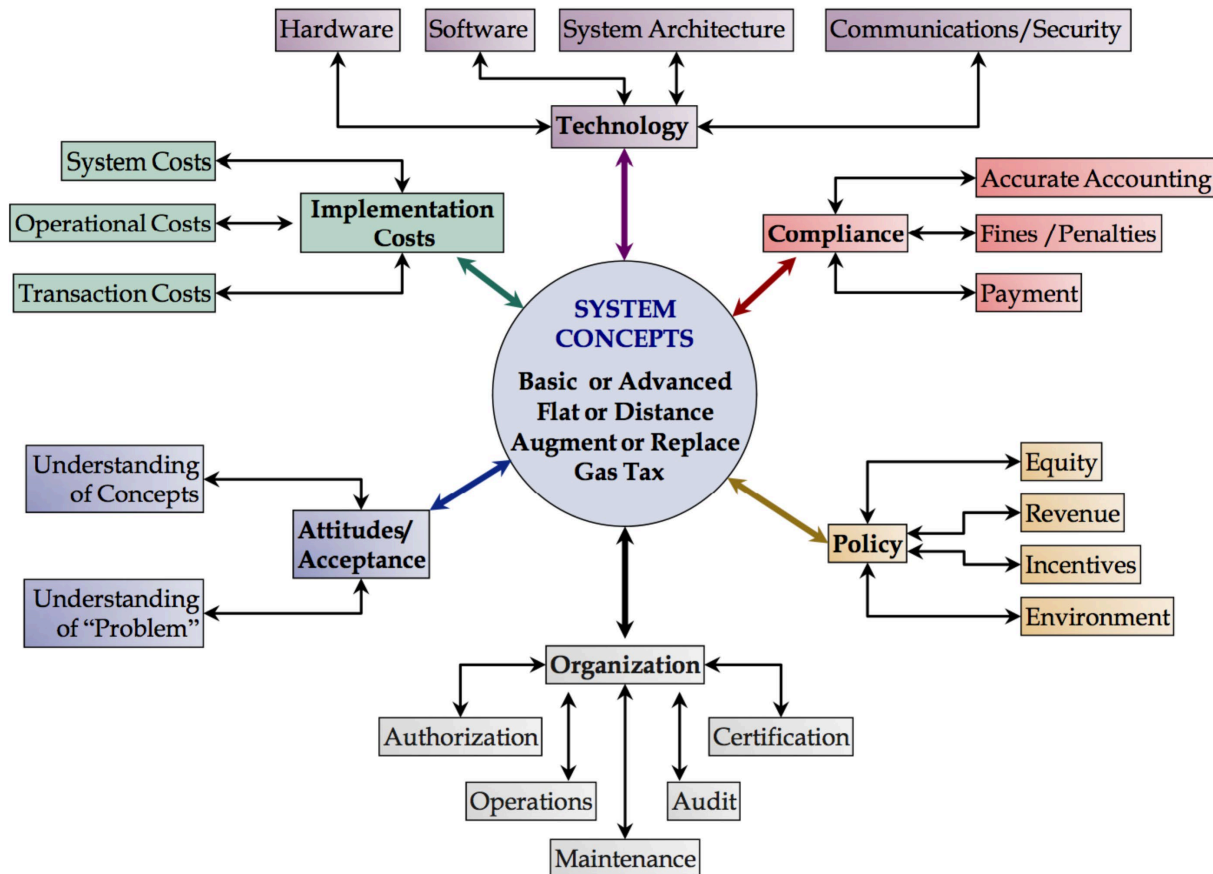
Meeting	Date	Primary Discussion Topics
1	September 13, 2012	Steering Committee organization Definitions and report on road usage charging activities elsewhere Policy considerations in Washington State Potential technologies Public acceptance issues Steering Committee goal setting and criteria
2	October 30, 2012	Technology, administrative and standards assessment Preliminary assessment of policy issues Preliminary road usage charge concepts for consideration
3	December 4, 2012	Draft Preliminary Feasibility Assessment Report Draft preliminary work plan and budget
4	January 11, 2013	Final Preliminary Feasibility Assessment Report Final Preliminary work plan and budget Draft communications materials for use at Legislative hearing
5	Date TBD: March 2013	Refined work plan and budget based on legislative feedback Preliminary analysis or preparation for future system test or pilot
6	Date TBD: May 2013	Final analysis or preparation for pilot Draft Final Report (policy parameters, public opinion / consumer acceptance assessment, preliminary operational concepts)

Section 2:

Summary of Lessons Learned for Washington

Main Lesson Learned: Road Usage Charging is a “Wicked Problem”

- Transitioning from fuel tax to a road usage charge is a classic example of a “wicked problem.”³
- Wicked problems involve highly interdependent systems.
- To improve one aspect of the system without considering each of these interdependencies may produce unexpected and unwelcome side effects in other parts of the system.



³ Rittel, Horst, and Melvin Webber; "Dilemmas in a General Theory of Planning," pp. 155–169, Policy Sciences, Vol. 4, Elsevier Scientific Publishing Company, Inc., Amsterdam, 1973.

Summary of Lessons Learned

Section 9 provides greater detail about the lessons learned for Washington. We have categorized the lessons according to the system concepts: policy, technology, organization, attitudes / acceptance, implementation costs, and compliance.

Policy

- General
 - > Policy objectives drive every other aspect of the program, from technology to communications.
 - > Road usage charging is not tolling.
 - > Light vehicles (cars) and heavy vehicles (trucks) are not the same.
- Revenue-Impacting Policies
 - > Rate-setting is a stumbling block.
 - > Double taxation emerges as an issue again and again.
 - > Fuel taxes are here to stay.
- Technology-Impacting Policies
 - > Flexible systems do not exclude future options and evolutions.
 - > Interoperability is a political issue in addition to a technical issue.
- Equity
 - > Fairness among distinct types of users.
 - > The use of revenues generated.
 - > Preventing evasion is another element of fairness.

Summary of Lessons Learned (continued)

Technology

- Manual Approaches
 - > Manual collection of road usage charges is a tested alternative.
- Automated Approaches
 - > Non-location-based technology can be used to support road usage charge collection — and they can mitigate the privacy concerns introduced by location-based technologies.
 - > Automatic License Plate Recognition (ALPR) can be used for enforcement in limited areas.
 - > Personal wireless technology is a tested option for the collection of road usage charges.
 - > GPS is a feasible and accurate technology to use for computing road usage charges.
- Open Systems
 - > Open standards are useful for keeping technology features up-to-date and prices down.
 - > Customers want choices in technology.
 - > Value-added services are attractive features to many customers and can provide an ancillary revenue stream to vendors.
- Transition
 - > A “big bang” conversion to road usage charging has never happened.

Summary of Lessons Learned (continued)

Organization

- In the U.S., implementation of road usage charging is most likely to occur at the state level and not the Federal level.
- Opportunities exist for both the public and private sectors to operate road usage charge programs.
- Public body performance management to support program evaluation.

Attitudes / Acceptance

- Baseline Perceptions and Understanding
 - > There exists a lack of public understanding about transportation funding generally, the scale of the problem, and what it means nationally and for Washington State.
 - > The parameters of this study will help to shape public perceptions.
- Consumer Privacy Expectations
 - > Protection of personal travel information is a major public concern.
 - > If the private sector is involved in carrying out a road usage charge system, how will they maintain consumer privacy?
- Expected Public Reactions
 - > The committee should anticipate initial reservations as a natural reaction.
 - > Concerns over “big government” must be addressed when determining the role that government plays in the program.

Summary of Lessons Learned (continued)

- Implications of Public Attitudes for Messaging
 - > Messaging should make clear the relationship between road usage charging and gas taxes.
 - > Uncertainty breeds apprehension, so messaging should wait until many program details are known.
 - > Regular program evaluation is important, and the public should know about plans to evaluate the system regularly.
 - > Media sound bites have misrepresented road usage charging in the past, fanning controversy around the concept. All sound bites should be crafted carefully.
 - > Messaging should include the fact that implementation will NOT occur tomorrow.

Implementation Costs

- The public will object to a system if the perceived cost of operation is too high.
- A cost model can be helpful for analyzing policies under consideration to understand the impact of choices on system costs.
- Leveraging private industry to the degree possible will decrease costs and increase public perception of the road usage charge as being efficient.
- The fuel tax is one of the most efficient taxes that governments collect.
- Economies of scale apply to road usage charges.
- Combining road usage charge hardware with hardware used for other services (smartphones, in-vehicle telematics, pay-as-you-drive insurance dongles) tends to decrease costs.

Summary of Lessons Learned (continued)

Compliance

- A substantial fraction of motorists will comply with tax requirements without enforcement or penalties.
- The precise form of compliance will vary depending on the type of technology chosen to facilitate road usage charge collections.
- Recording odometers at safety inspection, title transfer, and on maintenance records (as required by Federal anti-odometer-rollback laws) can provide an effective backup means of generating compliance.
- There is a trade-off between the cost of enforcement and revenue “leakage” (revenue lost to evasion).

Section 3:

Types of Road Charging: Definitions, Examples, and Purposes

Reasons and Ways to Charge for Road Use

There are many reasons to assess charges on road users, and many ways to implement such charges in practice. Reasons include revenue generation for roads, revenue generation for other purposes, congestion management, and environmental protection. Types of charges include fuel taxes, tolling, congestion-based charging, and road usage charging.

Practitioners often use terms such as tolling, congestion pricing, and road usage charging interchangeably, but there are substantive differences among them, and it is easy to get confused. The list below provides brief descriptions of four forms of charging in order to clarify the differences. The table on the next page summarizes types of charging in greater detail.

- **Fuel tax.** Charges assessed on fuel consumed by road users.
- **Toll.** Charges assessed on users of a specific highway, bridge, or tunnel, (such as on Tacoma Narrows Bridge and SR 520 in Washington) including express toll lanes (such as SR 167).
- **Congestion charging.** Charges assessed during specific times and at specific places to change travel behavior and manage congestion.
- **General road usage charging.** Charges assessed across the entire network of roads based on measured usage to generate revenue to pay for construction, maintenance, and operations of a road network.

The sole focus of this study is “general road usage charging,” which we are defining as an alternative means of paying for the road system in general.

The sole focus of this study is on “general road usage charging,” which we define as an alternative means of paying for the road system in general. The table on the next page provides more details about various types of charging.

Type of Charging	Examples	Primary Policy Objectives
<p>Fuel taxes. Usually fixed rate per amount of fuel purchased.</p>	<p>Worldwide</p>	<p>Revenue generation for a network of roads through user fees based on fuel consumed by a subset of vehicles (e.g., gas, diesel). Rarely linked to externalities such as emissions or congestion.</p>
<p>Tolls. User fee for driving on a particular bridge, tunnel, or road, including express toll lanes</p>	<p>Worldwide</p>	<p>Revenue generation for a specific road, bridge, or tunnel through user fees based on vehicle type (size, weight, axles), distance travelled, and, in some cases, time of day.</p> <p>Provide a faster and / or more reliable option for express toll lanes.</p>
<p>Congestion charging (e.g., cordon charges, area charges). A charge to enter or drive within a limited area – typically a congested downtown core</p>	<p><i>In Operation:</i> Norway (various cities), Singapore (strategic Road Network), London (area), Stockholm (cordon), Italy (preserve historic urban centers)</p> <p><i>Major Studies:</i> Hong Kong, NYC, San Francisco, Los Angeles, Manchester, Auckland</p>	<p>Manage congestion, improve speeds.</p> <p>Generate revenues through direct user fees based on vehicle type and time of day, sometimes directional and seasonal.</p> <p>Discourage driving and encourage shift to non-driving modes.</p>
<p>General road usage charging (for trucks)</p>	<p><i>In Operation:</i> U.S. (OR, NM, NY, KY), New Zealand, Switzerland, Austria, Germany, Australia, Czech Republic, Slovakia, Poland, France</p> <p><i>Major Studies:</i> Sweden (Arena), Belgium, UK, France</p>	<p>Revenue generation for a network of roads through user fees on the subset of the fleet that is heavy vehicles. Typically assessed by vehicle size, weight of freight carried, engine type, and sometimes other externalities.</p>
<p>General road usage charging (for light vehicles)</p>	<p><i>In Operation:</i> New Zealand (diesel only)</p> <p><i>Vignettes in Operation:</i> Austria, Belgium (2013), Bulgaria, Czech Republic, Hungary, Romania, Slovakia, Slovenia, Switzerland</p> <p><i>Major Studies:</i> Netherlands, U.S. (OR, MN, WA, CO, I-95 Corridor)</p>	<p>Revenue generation for a network of roads through user fees based on distance travelled by a subset of light vehicles (e.g., New Zealand on diesel vehicles and proposed in Oregon on electric and plug-in hybrid vehicles) or time spent on the road network (e.g., Eurovignette).</p>

What “General Road Usage Charging” Is

Highway agencies require a reliable, sustainable revenue stream to construct and maintain roads. Road usage charges would create this revenue stream while allocating costs to road users in proportion to their usage. The general road usage charges that will be the subject of this feasibility assessment will be:

- **Network Wide.** Road usage charges assessed across an entire network of facilities for a specified geography rather than for a single facility, corridor, or “trunk line” as is often the case in tolling.
- **Charged 24 / 7.** Charges would be assessed regardless of the time of use. In this respect, road usage charges are akin to a basic utility model or any other consumer product in which the user of a good or service is expected to pay for it at the time of use.
- **For General Highway Use.** Revenue allocation would span a broad region or State, rather than a single facility or limited jurisdiction.

What “General Road Usage Charging” Is Not

General road usage charging is not congestion charging, tolling, or express lane charging. Differential levels of service offered by express lanes, behavior-modifying mechanisms such as congestion charging, and environmental impact fees are separate policy mechanisms that, while related to road use, are not part of road usage charging as we define it for this assessment.

- **Congestion charging.** Congestion charging is designed to address congestion and is limited in scope or area to congested zones or corridors in urbanized areas or other heavily travelled routes.
- **Tolling.** Road tolling is specific to particular facilities. Charges apply only to defined points or segments including bridges and tunnels. Especially when managed by special purpose agencies or private entities, revenues are dedicated to the tolled facility or other narrowly specified uses and rarely to a highway or transportation network.
- **Express lanes.** Like tolling, express lanes (or “HOT” lanes in the U.S.) involve facility-specific charges. There is limited revenue opportunity. Charges often combine revenue with secondary objectives of congestion management or abatement.

Policy Objectives of General Road Usage Charging

- **Primary Objective: Revenue Generation.** The primary purpose of general road usage charging, as we define it, is to raise revenue. The use of that revenue may vary. In practice, examples of the allocation of these revenues include:
 - > **Revenues dedicated to highways.** New Zealand's road usage charge is dedicated to the highway system, transport studies, and environmental projects.
 - > **Revenues dedicated to transportation.** Examples include U.S. Federal fuel taxes that are devoted to the Highway and Transit Trust Funds. Most state gas taxes are similarly devoted to transportation uses, if not dedicated explicitly to highways. Like most European truck charging schemes, Germany's heavy truck taxes are devoted to roads, rails, and waterways. Congestion charging schemes in Singapore and London are devoted to urban transport systems (rail and bus mass transit).
 - > **Revenues partially dedicated to highways or transportation.** Outside the U.S., particularly in Europe, revenues deriving from road users such as fuel taxes and tolls are often diverted to non-transportation uses. In the UK, less than half of road revenues were devoted to transport and only 20% to highways (in 2010, out of £50 billion).
 - > **Revenues devoted to a general fund.** In many places around the world (but not in the U.S.), road usage-derived charges including fuel taxes are deposited into a general fund together with other tax revenues. Because funds are fungible, there is no meaningful link between revenues and spending.
- **Secondary Objectives:**
 - > **Manage demand / congestion.** Prices can influence the demand for transportation. Therefore, it is possible to use price to manage demand in addition to raising revenue.
 - > **Protect the environment by reducing fuel use.** Fuel taxes directly discourage fuel consumption. France's "eco-tax" on heavy vehicles and the Swiss heavy vehicle tax have explicit tax components based on environmental impact. Austria utilizes road usage charging to help shift freight from roads to rails. In all of these cases, revenue is still a primary objective.
 - > **Influence travel behavior and other decisions such as land use.** All charges or taxes affect user behavior. Some are explicitly designed to influence choices, such as the very high fuel taxes found in Europe, congestion charges, and environmental taxes. Charges which seek only to recover costs of road use such as New Zealand's road usage charge and U.S. fuel taxes have less impact on personal decisions.

Actual Experience With Road Usage Charges is Limited

Though studied extensively, both by academics and by practitioners, implementation of road usage charging has been limited:

- **New Zealand.** All heavy and alternative fuel vehicles have been subject to road usage charges since 1978 using a low-tech system where drivers buy blocks of kilometers. Newer systems that use advanced technologies to measure and pay charges are being phased in.
- **European Vignette Systems.** Several European nations use vignettes (stickers) that allow drivers to use certain roads for a designated time (a few days to a year.)
- **U.S.A – Weight-Distance Taxes.** Over 20 States implemented weight-distance charging for commercial vehicles in the mid-20th century, but only four programs remain (KY, NM, NY, and OR), the rest having been replaced by diesel taxes. The reasons for switching from weight-distance charges to diesel taxes included high cost of collection for government agencies, high cost of compliance for operators, evasion, and legal action by the American Trucking Association.
- **U.S.A – IFTA and IRP.** Interstate truck operators report miles state-by-state in order to convert diesel taxes and registration fees into mileage-based fees through the International Fuel Tax Agreement (IFTA) and International Registration Plan (IRP), respectively.

Sections 4-7 provide more details on many of the systems mentioned on this page and the next.

Studies and Proposals of Road Usage Charge Systems Are Numerous

- **International:** UK, Singapore, Hong Kong (light vehicles); Sweden, France, Belgium (heavy vehicles); Netherlands (all vehicles);
- **Domestic:** Several high-profile trials:
 - > Puget Sound Regional Council 2002-2003. Tested user responses to differential charges based on time of day and facility type.
 - > Oregon 2006-2007. The first trial tested differential charges based on zone. The upcoming 2012 trial will not.
 - > University of Iowa 2009-2010. Tested user experience with GPS technology for tracking and road usage charging.
 - > Minnesota 2010-2011. Tested user reaction to the concept of road usage charging through onboard technology.
 - > Oregon 2010 to current. Testing user choice and acceptance through multiple options: technology vs. non-technology, government vs. commercial account management, various payment methods and reporting periods.

Section 4:

Highlights of Road Usage Charging Efforts Outside the U.S.

Introduction

Operational Systems

There are two operational systems in place today:

- New Zealand's distance-based road usage charge for diesel vehicles, which has been in continuous operation since 1978 and in the midst of an evolution to accommodate advanced technologies. This is described in detail in Section 5.
- Vignette (sticker) systems in some European countries, which are time-based road usage charges are described more fully in Section 6.

Studies and Pilot Tests

Four countries outside the U.S. have studied and conducted pilot tests of road usage charging:

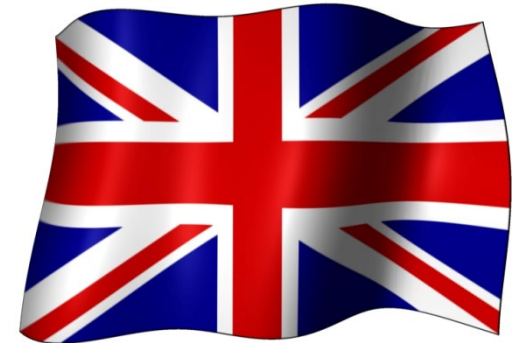
- United Kingdom, 1964 – Present;
- Singapore, 1978 – Present;
- The Netherlands, 1988 – 2010; and
- Hong Kong, 1983 – 2009.

These four experiences are the subjects of this Section. While there are many differences, they share the following characteristics in common:

- Studies have been underway for several decades or more;
- Road usage charging was coupled with one or several companion policies such as congestion charging, tolling, and environmental impact charging;
- The studies have continued for many years or decades and have rarely led to the implementation of new operational systems; and
- Policymakers often undergo several "rounds" of study, outreach, and analysis before a system is implemented.

UK Studies of Road Usage Charging

1964: Smeed Report. The UK Ministry of Transport's study of road revenue alternatives contained among the earliest recommendations for wholesale changes in road pricing and policy. The report advocated zone-based road usage charging of the entire national road network, with prices varying by location, time of day, and type of vehicle. It recommended that prices reflect not only road costs but also congestion and environmental factors and suggested several approaches to measuring road usage in dense road networks such as in-vehicle meters and payment devices. The recommendations were further studied and modified until ultimately the proposals were abandoned altogether in 1970 with a change in government.



Mid 1990s-Present: Lorry Road Usage Charging. The notion of charging trucks for road usage through time- or distance-based charging mechanisms has been under discussion in the UK since the Smeed Report. In the mid-1990s the Conservative government endorsed the idea, but since then, no scheme has been implemented due to objections of various stakeholder groups, changes in policy direction, and bundling truck charging with broader transport policies.

2004: Road Pricing Feasibility Study. In 2004, a national steering committee produced a report providing guidelines for studying, designing, and proposing road pricing schemes, following the successful imposition of congestion charging in 2003 in Central London.

2005: Lorry Road User Charging merged with National Road Pricing. This resulted from some of the recommendations of the feasibility study.

2007-2008: Efforts Abandoned: Owing in part to an e-petition, which garnered nearly 2 million signatures in opposition, the government abandoned the national lorry road user charging proposal. Critics questioned privacy and cost aspects of the plan, which envisioned "time-distance-place" pricing involving complicated algorithms and GPS devices in every heavy vehicle.

2010-Present: Lorry Road Usage Charging Re-emerges. The political acceptability of lorry road usage charging recently resurged. Truckers favor the scheme as a method of leveling the playing field with foreign trucks that purchase fuel in relatively lower-taxed continental Europe and use UK roads. A scheme must comply with European Union vignette directives.

The Netherlands Road Usage Charging Programs – Origins and Timeline

The Netherlands funds its roads from sales taxes, fuel taxes, and annual operating taxes based on vehicle weight and fuel consumption. Road pricing and road usage charging proposals have been made six times since 1988, all of them ultimately unsuccessful.

1988: Rekening Rijden I. Proposed road usage charges based on distance traveled in the Netherlands.

1992: Spitsvignet. Proposed peak period charges in urban areas.

1994: Rekening Rijden II. Proposed AM peak period cordon charges around four cities: Amsterdam, Rotterdam, The Hague, and Utrecht.

1999: Spitsstarief. Proposed cordon pricing with access point tollbooths in the Randstad conurbation.

2001: Kilometerheffing. A proposal for a distance-based road usage charge system.

2005: Anders Betalen voor Mobiliteit. The purpose of “Paying Differently for Mobility” was to develop a more equitable method of paying for road usage. An explicit objective was to modify the existing tax system in order to streamline and simplify revenue collection. The cabinet indicated that the introduction of road usage charges for light and heavy vehicles had secondary objectives of reducing travel times, improving reliability, and supporting the efficient distribution of economic activity, subject to budgetary limitations. The government’s Mobility Policy Document to 2020, published in September 2005, stated that: *“The cabinet considers the introduction of a kilometre fee in combination with a reduction in road taxes to be a workable alternative... The state will take all steps needed to introduce a system for levying a ‘fast-track fee’. The proceeds will be used to expedite the resolution of existing bottlenecks. To enable a future cabinet to reach a decision regarding the introduction of a road pricing system, the current cabinet will make all necessary preparations. The introduction of such a system will coincide with a lowering of road and / or vehicle taxes.”*

The Netherlands did not implement any of these programs.



The Netherlands Road Usage Charging Programs – Reasons Not Implemented

The purpose of the road usage charge proposals was to reorganize an existing hodgepodge of taxes to be simpler, while doing so in a cost-effective way. The government competitively reviewed costs of proposed road usage charging systems with the aim of making a strong case for value, as measured by system costs relative to benefits and revenues.

In summary, the objectives were:

- Replace the current tax regime to be simpler for users while maintaining the same net revenues;
- Reduce congestion;
- Improve air quality,
- Prevent climate change; and
- Sustain economy.

Reasons cited by Dutch government officials for the failure of the efforts include:

- “Keep It Simple Stupid.” Despite the objective of simplicity, road usage charging policy had too many objectives, making the program a target for opposition. It was simply trying to do too much. They lost focus on the originally stated primary objectives, which were:
 - > Pay for roads in a direct way based on usage rather than ownership;
 - > Revenue neutrality; and
 - > Dedicate revenues to the transportation sector.
- Opponents exploited weaknesses in the complex proposals damaging public relations.
- A technology-centric approach led to reliance solely on GPS-based measurement alternatives as the only options for deployment because of the multi-faceted objectives sought by the program.

Singapore Road Usage Charging – Origins and Timeline

The primary objective of the Singapore road usage charge program has always been to reduce and manage congestion, with revenue as a secondary objective. Given the level of consensus in the Singaporean government, implementation was not as challenging as it has been in Europe and the U.S.

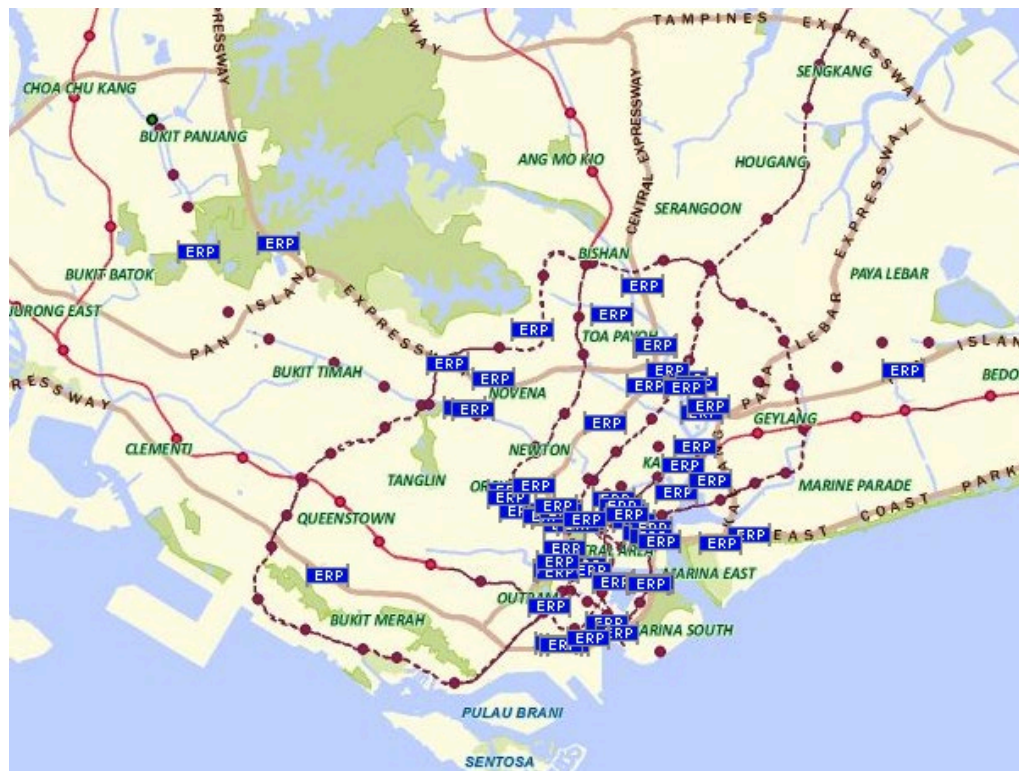
1975: Area Licensing Scheme. Singapore is first to attempt congestion charging with a paper license scheme to control congestion in the Central Business District using a cordon approach.

1998: Transition towards Electronic Road Pricing. Building on the success of the Area Licensing Scheme, but seeing successful trials of technology elsewhere (including Hong Kong), Singapore begins a transition toward Electronic Road Pricing.

1998 – Present: Expansion of Electronic Road Pricing. Singapore uses gantries (mobile point charging units depicted as blue “ERP” labels in the image on this page) to address congestion along major arterials and secondary routes in a dynamic, responsive fashion. As congestion is diverted and dispersed across the network, road operators respond by updating prices quarterly and deploying new pricing gantries periodically.

Although singularly driven from the outset to address congestion and operated today as a series of cordon and point charges with dynamic pricing, the extent of the coverage of the network (see, again, gantry locations in the above map) is nearly sufficient to deem the scheme a “road usage charge” as we define it in this study.

The quasi-authoritarian political structure allowed Singapore to pursue a road usage charge program with multiple policy objectives while offering a closed technology solution — there is one type of onboard unit that is mandatory for all registered vehicles and visiting foreign vehicles to have.



Hong Kong Road Usage Charging Trials – Origins and Timeline

Hong Kong was the first place to experiment with electronic road usage charging in the early 1980s. Although the tests were successful, they never implemented an operational program. A second study sought to update the pilot findings in the late 1990s, but again languished due to an economic downturn and political resistance. A final update was performed in 2004, but no action has yet been taken to introduce general road usage charging.

1983-1985: Electronic Road Pricing Pilot Test. These early tests examined the technical feasibility of road usage charging within Hong Kong at a variety of points based on zonal pricing. Although a technical success, the concept was not implemented because of aggressive transportation improvements that abated congestion by the mid-1980s, an economic downturn that suppressed growth in car ownership, and public opposition to an exemption for taxis, which were perceived to cause the majority of congestion.

1997-2000: Electronic Road Pricing Feasibility Study (ERPFS). The objective of this updated ERPFS study was to define the appropriate objectives and scope for road pricing, develop the best corresponding strategy, define and test the road pricing system best suited for Hong Kong, and compare road pricing with other alternatives. The study incorporated social, economic, and environmental factors into the analysis. Again, an economic downturn was the primary factor in the failure to implement an operational system. Four configurations were evaluated as part of the strategy development and testing across the Hong Kong special administrative region.

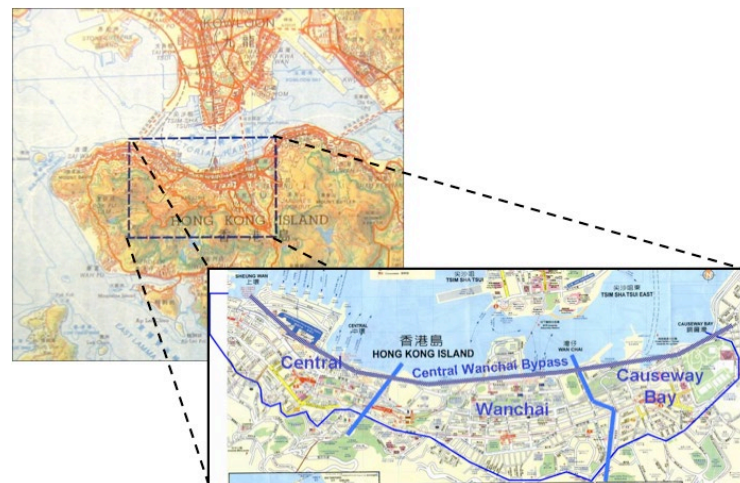
- **Cordon-based:** vehicles would be charged each time they pass a charging point.
- **Distance-based:** charges would be related to the distance traveled within the charging area during the charging period.
- **Time-based:** charges would be related to the time spent within the charged area: either the time the vehicle is in operating mode, or the total time (including inactive time).
- **Congestion-based:** charges would be based on time spent in the charged area while traveling below a set speed for a set time.

2006-2009: Update to Electronic Road Pricing Feasibility Study. In this most recent update, the emphasis was on congestion charging and re-evaluating the findings of the 1997-2000 ERPFS study.

Hong Kong Road Usage Charging Trials – Conclusions and Reasons Not Implemented

Electronic Road Pricing Feasibility Study Conclusions

- Time-based or real-time congestion charging are not suitable due to safety concerns such as motorists speeding to avoid charges.
- All else equal, “simple” charging schemes are preferred.
- Privacy concerns can be resolved without abandoning technology options.
- Enforcement using video systems requires improvement before a system can be deployed.
- Exemptions for particular classes of users was a recurring issue:
 - > In a congested area all trips contribute to the congestion;
 - > If there are any exemptions it becomes difficult to define which types should and should not be charged — i.e., “exemptions breed exemptions”;
 - > Some vehicle classes are more efficient passenger carriers than others; and
 - > Exempting classes will have an impact on public acceptability (positive or negative, depending on the policy).



Map of Hong Kong
Central Business District

Ultimately the Repeated Decision Not to Implement Road Pricing Was Due to:

- Economic crises in the mid-1980s, 1998, and 2008-present, which led to reduced congestion and reduced urgency for infrastructure improvement.
- Proposed exemptions for particular classes of vehicles which raised concerns over fairness.

Relevance to Washington State

Many countries have studied road usage charges as standalone proposals or as part of broader policy packages over the past several decades. Only a few have successfully implemented a road usage charge system.

Common reasons why policy initiatives do not advance beyond the study and testing phases.

- Lack of agreement on the problem that road usage charging purports to solve.
- Mixing numerous policy objectives into a single package, leading to contradictory outcomes. For example, road usage charging aims to generate revenues, while environmental fees aim to reduce road usage and, therefore, reduce revenues.
- Public resistance to complicated or controversial policy packages that are difficult to explain.
- Discomfort with new technologies that are misunderstood or not fully developed.
- Comprehensive road usage charging proposals encourage specific user groups to seek exemptions — ultimately this leads to inequities that can damage the overall policy credibility.

Understanding political cycles of past road usage charge system proposals can inform new investigations and proposals.:

- Multiple studies and attempts are typically needed, with the anticipation that public attitudes will shift.

Overall, experimenting with innovative, leading-edge technologies, while appealing to some transportation practitioners, may create political and user uncertainty that undermines the underlying policies that the technology aims to facilitate (e.g., many users perceive GPS as invasive of privacy despite its merits as a technical solution).

Section 5:

Implementation of New Zealand's Road Usage Charge Program

Overview of New Zealand Road Usage Charging

History

Because the majority of diesel fuel in New Zealand is consumed by agricultural equipment, watercraft, and other non-road uses, taxing diesel as a source of cost recovery for roadways was unpopular with most diesel consumers as well as administratively counterproductive given that diesel used off road could claim tax refunds.

- **Started in 1978** - In 1978, New Zealand introduced a road user charge (known in New Zealand as RUC) on all non-gasoline vehicles as well as any vehicle weighing more than 3.5 metric tons. A simple paper-based scheme was adopted that relies on odometer readings, windshield mounted sticker licenses, and roadside enforcement.
- **Few non-gasoline light vehicles** - At the time of adoption, the number of non-gasoline light vehicles was insignificant. Over the past three decades, the number of diesel light vehicles has grown impressively to the point that today there are more light vehicles than heavy vehicles subject to road usage charges in New Zealand.
- **Compliance** - Compliance is enforced through roadside inspections. Police have authority to ticket motorists subject to road usage charges whose licenses are not current. Because New Zealand is an island nation, cross-border issues are minimal to nonexistent. All road usage charge payers are subject to audit.
- **2008: Update Policies and Technology** - In 2008, government commissioned an independent review to provide recommendations on updating policies and technologies associated with road usage charges. The group provided a number of recommendations summarized at the end of this Section, punctuated by the following passage:

A good charging system should not be discarded in the pursuit of a perfect system. The policy aim should be for a system that accomplishes as many and as much of the objectives as possible at low cost and, from a dynamic perspective, is not so complicated that different parties are constantly tempted to chip away at various components and undermine it".
- **2009: Private Sector Agents** - The government began to certify private sector agents to handle tax reporting and collection on behalf of road users, based on secure electronic methods as a replacement for paper-based reporting.



Overview of New Zealand Road Usage Charging (continued)

Categories of Vehicles Subject to Road Usage Charges

The New Zealand Transport Agency manages an account for every vehicle in two categories:

- All vehicles over 3.5 tons; and
- All other vehicles that do not use a fuel taxed at source (including diesel).

Number of Vehicles Subject to Paying Road Usage Charges (as of 2010)

Type of Vehicle	Number
All powered vehicles over 3.5 tons	164,000
Trailers over 3.5 tons	301,000
Light diesel vehicles	525,000
All Road Usage Charge Liable Vehicles	990,000

Rate-Setting Road usage charge rates for light and heavy vehicles are decided by the Executive, and confirmed in Parliament. Rate setting is informed by a cost allocation model, which forecasts future road expenditures and allocates those expenditures according to vehicles by weight and category.

What Activities Are Subject to Road Usage Charges?

Road Network Subject to Road Usage Charges

Road usage charging applies to travel on all public roads in New Zealand. Vehicles on any public road must have a valid RUC license affixed to the windshield. RUC does not apply to travel on private roads or private property. Motorists with electronic distance measurement systems can use automatic measurement and computation of refunds for travel off road and on private property. Motorists without electronic distance measurement must record travel off public roads and utilize the manual refund process.

Refunds

Refunds can be claimed for travel off public roads. There are two methods: a paper form and electronic reports.

- Motorists must provide account information together with records of off-road travel, including the location of travel, the basis for the estimate of the distance travelled off road, and a brief description of the activity undertaken.
- Vehicle operators must keep records of all distances travelled off-road for auditing purposes.
- Heavy commercial vehicle operators and dedicated industries (e.g., forestry and logging vehicles) have dedicated staff to process the refund or utilize automated refund claims processing through certified agents (e.g., EROAD, International Telematics).
- Most private light vehicle owners seldom, if ever, claim refunds for off-road driving given the time and effort involved relative to the modest value of the refund.

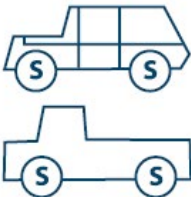
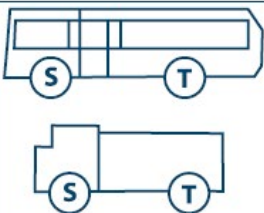
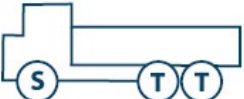
“Chargeable events” and Methods of Measurement

New Zealand considers every kilometer travelled a “chargeable event.” Drivers must pay in advance for distance travelled (unless they have a contractual relationship with a service provider who charges after distance is travelled on a credit basis).

- Technically, travelling 1 km over a road usage charge license is an offense, although in fact there is some discretion with enforcement of 100 km applied to allow for unforeseen additional distance travelled.
- Measurement is achieved through the odometer for light vehicles and hub odometer or approved electronic hub odometer for heavy vehicles. Since road usage charging requires prepayment, the odometer serves as proof as to whether a vehicle has exceeded the prepaid distance bought.

What Are Road Usage Charge Rates?

Vehicle Configuration and Weight Rate Tables

No. of axles	Types of axles	Example vehicles	Vehicle type no.
2	2 axles, both single tyred		1
	2 axles, 1 single tyred and 1 twin tyred		2
	Any other configuration		1
3	3 axles, one single tyred and two twin tyred		6
	Any other configuration		5
4	Any configuration		14
5 or more	Any configuration		19

Charge rates for distance licences

TABLE IV

Dollars per 1000 kilometres (621 miles) of distance to which licence relates

Maximum gross weight (in tonnes) to be specified on the licence	Vehicle type numbers				
	1	2	5	6	14
1	44.31	44.29	43.86	43.86	42.90
2	44.31	44.29	43.86	43.86	42.90
3	46.51	46.41	45.84	45.83	44.85
4	49.29	48.10	46.28	46.15	44.95
5	53.50	51.00	46.56	46.28	45.05
6	59.20	54.00	46.83	46.42	45.15
7	87.13	75.93	60.55	59.63	56.91
8	113.79	94.68	68.45	66.89	62.24
9	149.28	120.24	78.20	75.71	68.26
10	196.29	152.20	90.31	86.50	75.17
11	256.86	193.53	104.80	99.47	83.14
12	333.93	246.26	121.58	114.14	92.01
13	432.33	311.40	142.00	131.75	101.23
14	554.41	392.77	167.03	153.25	112.20
15	704.91	493.50	197.42	179.25	125.16
16	888.05	614.36	233.95	210.43	140.41
17	1108.31	759.51	275.99	247.16	158.27
18	1370.46	932.06	325.50	289.26	179.06
19	1679.58	1135.34	383.51	338.53	203.16
20	2041.04	1372.85	451.01	395.79	230.89
21	2460.48	1648.29	529.02	461.89	262.04
22	2943.84	1965.55	618.60	537.74	297.02
23	3497.36	2328.70	720.90	624.31	336.74
24	4127.56	2742.01	837.09	722.57	381.64
25	4841.24	3209.93	968.63	833.57	432.17
26	5645.50	3737.10	1115.10	959.30	488.81
27	6547.75	4328.36	1279.10	1097.92	552.07
28	7555.64	4988.75	1462.01	1252.45	622.46
29	8677.17	5723.45	1665.26	1424.12	700.52
30	9920.57	6537.89	1890.32	1614.17	786.81
Incremental rate	2116.19	1385.36	381.26	321.60	144.49
40	31,082.48	20,391.52	5702.93	4830.12	2231.73
Incremental rate	4458.72	2917.72	800.49	674.69	300.15
50	75,669.68	49,568.70	13,707.87	11,577.01	5233.26
Incremental rate	8105.33	5303.13	1453.11	1224.35	543.28

As a guide, the licences purchased at the rates shown in the screened blocks, would normally exceed the maximum legal weight for that vehicle type on a class 1 road. It is the operator's responsibility to ensure that they comply with all acts and regulations.

Payment Options and Charges

- Payment outlets available are:
 - > Gas stations contracted by New Zealand Transport Agency (NZTA);
 - > Automobile Association retail outlets;
 - > Post offices;
 - > Certified vehicle safety inspection stations;
 - > Independent agents;
 - > By telephone or fax via New Zealand Transport Agency; and
 - > Online.

• Payment outlets are entitled to charge a transaction fee for selling road usage charge products, paid by the driver. Transaction fees vary according to the outlet option selected and range from U.S. \$2.75 to U.S. \$7.95 per license.

- Payment options are dependent on the outlet, but typically include cash, debit, and credit cards. Service providers may also adopt a direct debit approach from bank accounts or may offer credit on their own terms and conditions within the law.

Sample Types of Transaction	Transaction Charge ⁴
Annual fee for ownership of RUC card	(U.S. \$7.73)
RUC card purchases	(U.S. \$2.75)
Automatic banking transfer	(U.S. \$2.75)
Electronic service provider (e.g., EROAD)	(U.S. \$2.75)
Any other payment option	(U.S. \$7.95)
Surcharge for telephone and fax transactions in addition to above	(U.S. \$2.93)

⁴ Including Goods and Services Tax at 15%.

Enforcement

Original focus on trucks. In the early 1990s, some independent studies estimated light vehicle road usage charge non-compliance as high as 30% due primarily to lack of education and lack of enforcement. That was because New Zealand Transport Agency and Police originally focused enforcement efforts on heavy vehicles (with a dedicated Police unit), where it was relatively easy to extend the enforcement processes on trucks to other commercial fleets. Commercial light vehicles also presented the largest revenue risk due to the large number of miles travelled. Enforcement for light vehicles was erratic and inconsistent.

More recent attention to light vehicles. In the past 15 years, this has changed. The Police traffic safety service (which focuses on cars) has also been contracted to check the road usage charge licenses of light diesel vehicles they stop for safety checks or offenses.

- Non-compliance rates have reportedly dropped from 30% to 6% (as a proportion of revenue) as a result of a range of measures targeting light diesel vehicles.
- The Ministry estimated a revenue loss rate of 6% from light vehicles liable for road usage charges and under 5% from heavy vehicles.

Enforcement Procedures. Enforcement of road usage charges is carried out through several processes.

- **On-road enforcement:** The Police check vehicles stopped for safety reasons, comparing odometer readings to displayed kilometer licenses. The Police can also contract with parking wardens of local authorities to make similar checks for vehicles with visible odometers
- **Debt-collection and intelligence:** A dedicated unit of New Zealand Transport Agency called the Economic Compliance Unit investigates road usage charge evasion. It is responsible for taking motorists to court to recover unpaid road usage charges after they have been identified as offenders.
- **Warrant of Fitness (safety) checks:** New Zealand vehicles are subject to annual Warrant of Fitness safety checks where odometer readings can be compared to licenses. Inspectors report these checks to Police to support enforcement efforts.

Penalties for Non-Compliance

Offences and Penalties

The obligation to pay the road usage charge license goes with the vehicle. The New Zealand Transport Agency manages the motor vehicle registry alongside road usage charging. If the vehicle is sold, the new owner is obligated to pay all road usage charges on the vehicle that may be in arrears. Offences are outlined in the following table.

Offence	Maximum Possible Fine
Operates a RUC liable vehicle, without a RUC license	\$3,000 NZ
Fails without reasonable excuse to supply books and records relevant in relation to an application for a refund	\$3,000 NZ
Makes any application for refund or a license knowingly providing incorrect information	\$3,000 NZ
Alters or willfully damages any hub odometer or odometer	\$3,000 NZ
For operating a RUC liable vehicle on a public road without a RUC license that displays the vehicle number plate, the distance measurement device registration number, the vehicle type (by RUC classification),	\$15,000 NZ
For operating a RUC liable vehicle with a gross weight higher than that specified on the RUC license	\$15,000 NZ
For operating a RUC liable vehicle with an unauthorized distance recorder, or a distance recorder not fitted legally, or a distance recorder not measuring distance accurately	\$15,000 NZ

Debt Collection

Unpaid road usage charges are subject to debt collection. The Agency is willing in special circumstances to make arrangements to spread debt repayments over a period of time (more likely for drivers that do not operate a transport business).



Auditing

In road usage charging, auditing means reviewing accounts in detail to verify compliance with program rules. Auditing serves as a deterrent to evasion and false reporting and as a tool for recovery of lost revenues. Road usage charge audits in New Zealand fall into two categories: compliance and refund.

Compliance Auditing

Auditing, and specifically compliance auditing, is a central function of the New Zealand Transport Agency's Economic Compliance Unit. Operators of truck fleets (and light diesel vehicle fleets) must maintain and make available to auditors the following: logbooks, time and wage records, fuel accounts, invoices, maintenance records and depreciation records.

Compliance audits may be triggered by referrals from police, industry intelligence, or exception reports. Exception reports are generated under the following conditions:

- Suspicious off-road refund claim activity by a fleet;
- A greater than 50% drop-off in total road user charge distance paid for a given vehicle compared with the previous 2 years;
- Analysis of trends in a vehicle or operator's police roadside inspection / weighing over months / years indicating unusual activity;
- A high frequency of offences (non-RUC as well as RUC) for a vehicle or operator; and
- A vehicles or operator being in the top 5% for the other types of exception reports.

Refund Auditing

New Zealand Transport Agency's Economic Compliance Unit may also conduct audits of all off-road refund claims (refunds for any distance driven off public roads are allowed as credits toward future road usage charge purchases). Any individual or fleet claiming refunds for off-road travel may be subject to an audit. Such audits are rare for light vehicle operators, given the small number of private motorists claiming such off-road refunds.

In the case of an audit, an Economic Compliance Unit officer may request access to all records that support off-road claims. Electronic road usage charge services give auditors easier access to reliable audit trails.

Management

Four government agencies are responsible for managing road usage charging in New Zealand:

- The Ministry of Transport (the Ministry)
 - > Sets policy such as rates, allowable transaction fees, and certification of independent agents and electronic equipment.
 - > Works with the New Zealand Transport Agency and the New Zealand Treasury to make revenue forecasts.
- New Zealand Transport Agency (NZTA)
 - > Combines the road usage charge registry function with the Motor Vehicle Registry. At the Transport Registry Centre (TRC) the combined system runs all traditional DMV functions (Licensing, Vehicle Registration, Safety Inspections, Drivers' License Testing, etc.) In addition, it handles not only road usage charges, but also Overweight Vehicle Licensing (and over-dimension vehicle licensing for vehicles on state highways only). The combination of all these services was done for efficiency.
 - > Performs audit functions through its Economic Compliance Unit (ECU).
- New Zealand Police (the Police)
 - > Responsible for enforcement.
- The New Zealand Treasury (the Treasury).
 - > Conducts revenue forecasting.

Public Acceptance

Light Vehicle Road Usage Charging

Since the vast majority of light vehicles (over 80%) are not subject to the charge, road usage charges for light vehicles has been largely acceptable.

- Although there are gasoline taxes in New Zealand, there is no tax on diesel fuel or other alternative fuels. The public sees road usage charges for light diesel-powered vehicles as a way to generate road usage fees fairly from all users.
- Until recently, fuel tax for petroleum included a significant additional tax that was not dedicated to the National Land Transport Fund (NLTF). Road usage charge users did not pay this tax, so they paid less to use the roads than petroleum powered vehicles. As of 2009 this has changed, with all petroleum tax dedicated to the NLTF, which consequently saw light road usage charge rates increase to ensure all light vehicles paid a fair contribution into the NLTF.
- Since diesel is substantially cheaper than gasoline (almost entirely because of the absence of tax on diesel), most light road usage charge users see themselves as getting a “good deal” since they pay for road usage only periodically.
- Commercial users have proposed that road usage charges be replaced with a diesel tax. A 2009 review (see next pages) considered this and dismissed it because of concern that fuel efficiency is eroding revenues from fuel related taxes.

Heavy Vehicle Road Usage Charging

Heavy vehicle stakeholders oppose road usage charges as in other countries due to the perception of high administrative costs.

- The government views the principal alternative to road usage charging, a diesel tax, as difficult to implement due to the large number of off-road users of diesel and the high degree of refund claims to be processed for use of off-road taxes. Having both taxed and tax-free diesel on the market might also increase evasion.
- Compliance with road usage charges is very strong, with less than 5% leakage.
- Costs of administration have declined with the introduction of electronic reporting options such as third party providers EROAD and International Telematics.

Report of the Road Usage Charge Independent Review Group

The New Zealand government performed an independent review of the road usage charge system in 2008-09 to consider the basis on which road costs and other costs of the National Land Transport Program should be allocated and to ensure that the charging system is “fair, efficient and based on up-to-date information.”⁵

Despite a number of recommendations and possible improvements, the Group emphasized the basic fairness and efficiency of the program as highlighted in the following excerpt:

“A good charging system should not be discarded in the pursuit of a perfect system. The policy aim should be for a system that accomplishes as many and as much of the objectives as possible at low cost and, from a dynamic perspective, is not so complicated that different parties are constantly tempted to chip away at various components and undermine it”.

Many recommendations related to how the cost allocation model contributes to determining the tax rates in association with the land transport funding framework. A summary of selected recommendations⁶ of the Review and the New Zealand Government’s response to them are outlined on the following two pages.

⁵ An Independent Review of the New Zealand Road User Charging System, Road User Charges Review Group, 31 March 2009.

⁶ Recommendations directly relevant only to New Zealand’s transport funding framework are not included here, only those related to the collection and operation of the RUC system for light vehicles.

Excerpted New Zealand Independent Review Group Recommendations

Recommendation	Government Response
Investigate alternative sources of revenue for non-road related expenditure.	Declined. Most of that expenditure is on public transport.
Consider replacing the pay as you go model with an asset-based model that amortizes expenditures on a road over the life of the asset.	Declined. Considered to be complex and raises transitional issues.
Make RUC rates consistent with the Cost Allocation Model results.	Declined. The Cost Allocation Model is a tool to inform rates decisions and does not take into account all considerations.
Replace annual motor vehicle license fees with a universal network access fee (i.e., a fixed basic fee for all road users) to recover fixed costs.	Declined. Would create equity problems between vehicles that travel high distances and those that do not.
Give priority to investigating and implementing a modern internet-based payment channel for RUC.	Agreed.
Terminate all RUC payment options other than over the counter sales once internet payment is set up.	Declined. Unduly restricts flexibility.
Dedicate more resources to improving RUC customer service delivery.	Agreed.
Review RUC rates annually and change rates at the same time each year.	Agreed.
Provide a six-week notice period for any changes to RUC rates (to allow for prepaid licenses to be used in that time and to avoid pre-purchase in advance of cheaper licenses).	Agreed.
Provide more stringent regulations on odometer tampering.	Agreed.
Require all vehicle inspectors to report odometer readings to the NZTA as part of vehicle safety inspection processes.	Agreed.

Excerpted New Zealand Independent Review Group Recommendations (continued)

Recommendation	Government Response
Require road users to keep RUC records and allow government officials to access such records as they can with other taxes.	Agreed.
Decriminalize enforcement of light vehicle RUC.	Agreed.
Implement a “proof of concept” trial to test the feasibility of the systems architecture for an electronic RUC system to inform decisions on how to proceed	Agreed.
Pursue enhancement of current system such that all vehicles be subject to RUC. RUC system will provide a revenue stream that is immune to changes in vehicle and fuel technology and capable of giving more accurate price signals to road users than fuel excise duties.	Agreed.
Do not alter the RUC system to cater to needs of specific industries or sectors because this would require a more complex and disaggregated road charging system.	Agreed. Current technology used does not allow for this
Changes in rates resulting from the Review should not be more than a 20% increase in any one year.	Agreed. First changes will be 10% on average.
Implement changes to rates resulting from decisions arising from the Review as soon as possible.	Agreed
A communications strategy will accompany any changes to ensure stakeholders are well informed.	Agreed.

Relevance to Washington State

- New Zealand’s program succeeded because clear, simple policy justifications were explained as the reason for the program—justifications such as recovery of costs to fund transportation construction and maintenance.
- Beginning with clearly defined classes of vehicles and road users—both of which were defined with simple, sound policy justifications—allowed New Zealand to achieve early buy-in among stakeholder groups. In contrast, proposing a “one-size-fits-all” charge would likely not have met with as much success.
- New Zealand did not prescribe specific technologies. This allowed industry to innovate a range of operational concepts and user comfort.

Section 6:

European Vignette Systems

What is a Vignette?

Windshield sticker. A vignette is a windshield sticker that allows a vehicle to use certain roads in a country for a defined period. Frequent users typically buy a vignette that is good for a year, but shorter periods (down to a few days) are also available, depending on the country

Electronic Vignettes. Two countries (Hungary and Romania) have recently moved toward electronic (e-Vignette) products. With an e-Vignette, no physical sticker is required on the vehicle. Instead, the license plate is registered with authorities for a set number of days.

Only Certain Roads. In most countries, the vignettes are required only to use the limited-access highway system (e.g., Autobahn).



Slovakian Vignette

Tax Out-of-Country Motorists. All countries that have vignettes also have fuel taxes, but as fuel prices vary across Europe, and distances are short, in many cases the fuel taxes are inadequate because foreign motorists may drive through a country without purchasing any fuel.

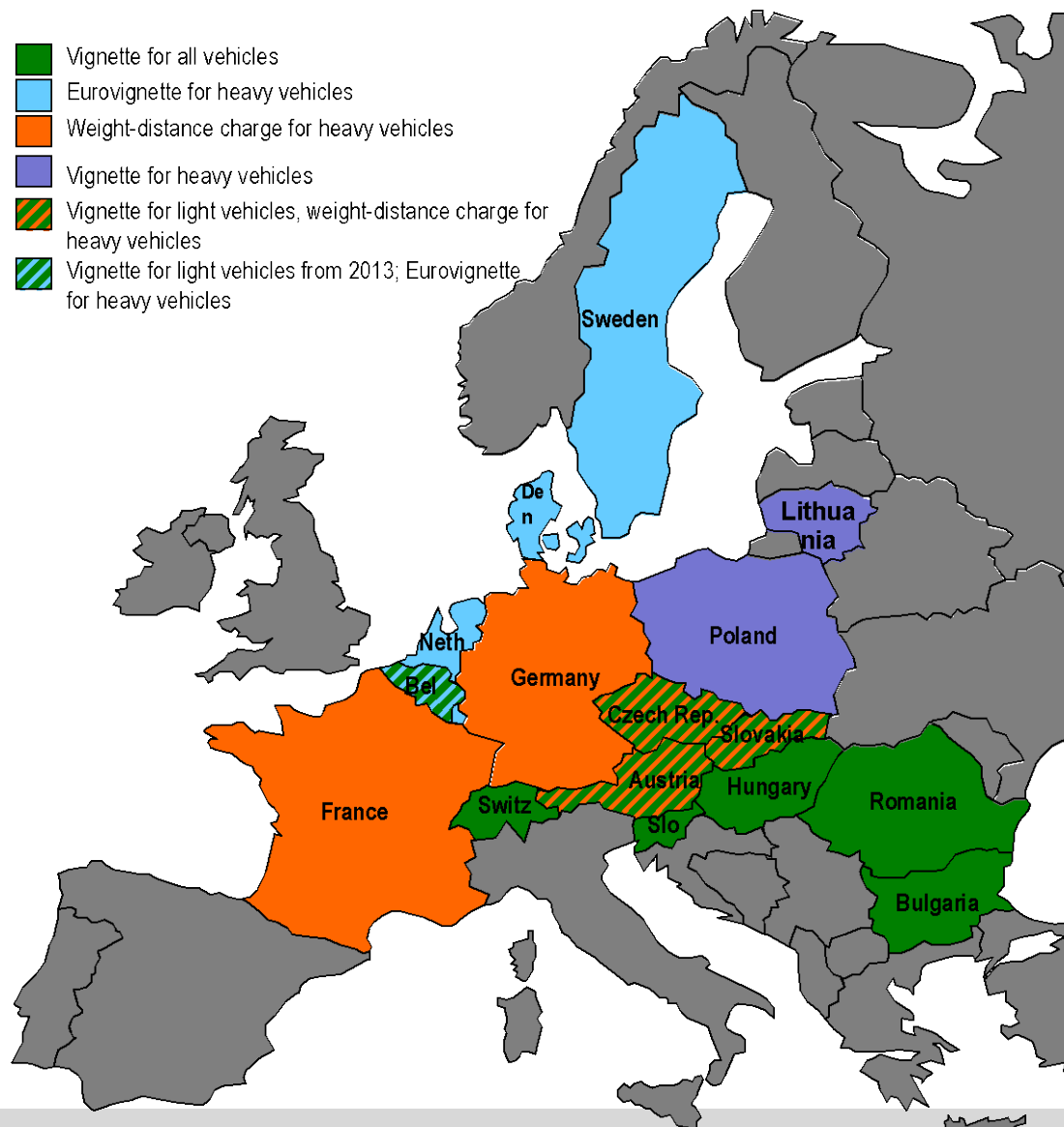
Non-discriminatory. European Union rules require that such systems be non-discriminatory in design and practice. This means systems must charge the same amount to everyone, regardless of nationality.

Migration to electronic systems that allow distance-based charging for heavy vehicles. Some countries with vignette systems (Austria, Germany, and Slovakia) have recently moved to electronic systems for heavy vehicles with distance-based charging. Distance-based charging better reflects actual system usage, and also generates more revenue since sticker vignettes are valid for a year regardless of usage.

Types of Vignettes by Country

The figure at the right shows how vignettes are used in various European countries. Countries shaded in gray do not use vignettes. Some special notes:

- **Electronic, Distance-based Tolls for Heavy Vehicles** are used in Germany, Austria, France, the Czech Republic and Slovakia.
- **The Eurovignette**, a multi-national electronic vignette for commercial vehicles is used in five countries: Denmark, Sweden, Netherlands, Belgium and Luxembourg.
- **Heavy vehicle vignettes** are used in Poland and Lithuania. They do not have vignettes for light vehicles.
- Slovenia has a vignette for cars, but heavy vehicles are required to stop to pay manual tolls.



Overview of European Vignette Systems for Cars by Country

Sticker and Electronic. Two of the eight countries with vignette systems for cars, Romania and Hungary, have migrated to electronic systems whereby users register online or by phone and pay for a “virtual vignette” corresponding to their vehicle number plates. Automatic license plate recognition (ALPR) systems are used on the roads for enforcement. ALPR systems used include both fixed overhead gantries and mobile units (temporary roadside mounted equipment that can be moved in police vans).

Gross Revenue. Revenue depends on the amount of the charge, amount of through traffic, and amount of domestic usage.

Costs. Available cost data varies by country, making the numbers here somewhat inconsistent. Specifically, costs vary depending on whether enforcement costs are included, and how much fixed overhead costs are attributed to the vignette system.

Country	System	Network Charged	Annual Gross Revenue ⁷	Number Units Sold	Total Operating Costs ⁸	Percent of Revenue Spent on Operations
Austria	Sticker	Motorway / expressways	U.S. \$494m	21,181,000	\$7,201,540	1.5% U.S.
Bulgaria	Sticker	All national roads	U.S. \$20m	N.A.	N.A.	N.A.
Czech R.	Sticker	Motorways / highways	U.S. \$167m	4,800,000	\$17,040,000	10.2% U.S.
Hungary	Electronic	Motorways only	U.S. \$127m	13,122,697	\$19,684,046	15.5% U.S.
Romania	Electronic	All main roads	U.S. \$114m	5,661,255	\$6,397,218	5.6% U.S.
Slovakia	Sticker	Motorways / highways	U.S. \$47m	3,283,581	\$295,522	0.6% U.S.
Slovenia	Sticker	Motorways / expressways	U.S. \$164m	3,779,679	\$9,146,823	5.6% U.S.
Switzerland	Sticker	Motorways only	N.A.	N.A.	N.A.	N.A.

⁷ 2009 data. Including any reported revenue from enforcement.

⁸ Reported costs, some do not include enforcement or fixed costs.

Overview of European Vignette Systems for Cars by Country (continued)

Prices vary from four days (Hungary only) to annual (all countries). There is no EU requirement for charges to reflect economic costs.

Vignette Prices by Duration (U.S. 2009\$)

Vignette Duration	Austria	Bulgaria	Czech Rep.	Hungary	Romania	Slovakia	Slovenia	Switzerland
4 days				7.09 ⁹				
Week		7.09			4.26	6.95	21.28	
10 days	11.21		14.18	13.33				
Month		18.44	19.86	21.99	9.93	14.04	42.56	
2 months	32.48							
Annual	108.08	48.23	66.67	195.46	39.72	51.77	134.75	47.98

When prices are averaged across the number of days charged, the variations are more apparent.

Average Daily Vignette Prices by Duration (U.S. 2009\$)

Vignette Duration	Austria	Bulgaria	Czech Rep.	Hungary	Romania	Slovakia	Slovenia	Switzerland
4 days				1.77				
Week		1.01			0.61	0.99	3.04	
10 days	1.12		1.42	1.33				
Month		0.61	0.65	0.72	0.33	0.47	1.40	
2 months	0.54							
Annual	0.30	0.13	0.18	0.54	0.11	0.14	0.37	0.13

⁹ Average of 6.10 and 8.08 across 12 months (varies according to season in order to manage congestion during peak holiday season).

Relevance to Washington State

- Vignettes are a form of road usage charge that is an alternative or supplement to the motor fuel tax. They are a flat tax — a single payment that includes all travel for a fixed period up to a year.
- Vignettes are simple: simple to implement and simple to enforce.
- Vignettes do not vary according to distance. They are available for specified periods, offering unlimited (all-you-can-drive) service. Therefore, they do not do well at allocating costs fairly among road users.
- Vignettes are proportionately more expensive for users that do not drive much.
- Vignettes require little or no technology and raise no privacy issues.

Section 7:

Road Usage Charging in the U.S.: Proposals, Studies, and Trials

Overview

General road usage charging has been discussed, proposed, studied, and subject to pilot tests in almost 20 states. This Section describes the more extensive road usage charging studies and trials in the U.S.:

- **Studies with completed trials** – University of Iowa (not fully reported); Oregon DOT (2007), Puget Sound Regional Council.
- **Studies with trials in progress** – Minnesota, Oregon DOT (2012).
- **Studies without trial (so far)** – I-95 Corridor Coalition, Nevada, Colorado, California.

Motivations for these efforts were similar to those in Washington: falling gas tax revenues caused by increasing vehicle fuel efficiency and the emergence of vehicles that do not use motor fuel. While these studies generally focus on generating revenues to cover road usage costs as their primary policy goal, several of these studies also considered reducing peak-hour urban congestion and reducing emissions.

Other states are also considering road usage charging, such as Ohio and Florida, but there have not yet been no substantive reports from these efforts.

Scope of Studies

- Most projects studied charging for in-state miles traveled only.
 - > The I-95 Corridor Coalition study was the only study to focus on road usage charging in a multistate environment.
- Some projects explicitly limited vehicles to which road usage charging would apply (For example, Oregon 2012 road usage charge policy is limited to Electric Vehicles and Plug-in Hybrids, though the trial may involve other vehicles).
- The number of participants in the trials ranged from 50 (Oregon 2012) to 2650 (University of Iowa).

Public Outreach efforts in these studies generally fell into the following categories:

- Detailed interviews of trial participants (University of Iowa, Oregon 2007); and
- Focus Groups with general public (Minnesota, Nevada).

Oregon Road Usage Charge Pilot Program (2002-2007)

Background / History

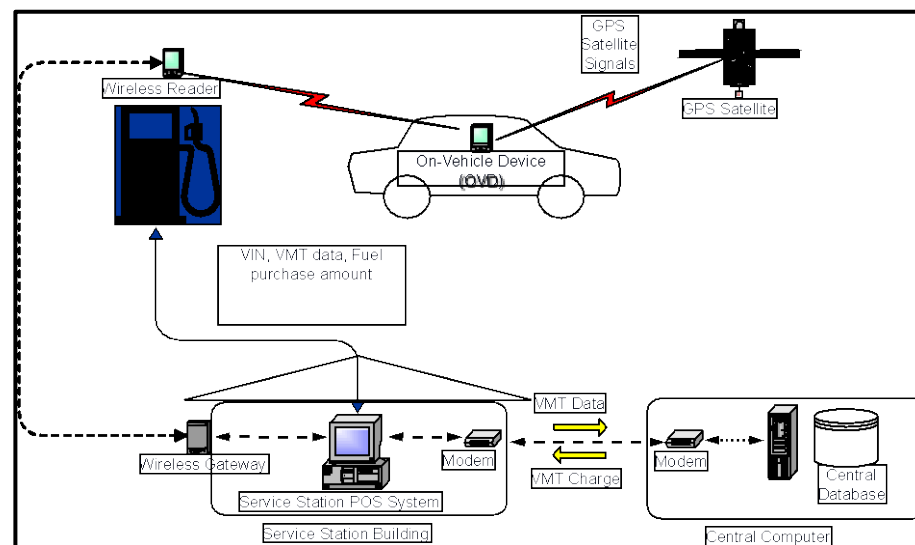
- The Oregon Legislature created a Road User Fee Task Force (RUFTF) in 2002 in response to the decline in gas tax revenues.
- RUFTF worked with the Oregon Department of Transportation (ODOT) to develop a system based on a “pay-at-the-pump” model.
 - > Vehicles liable for the road usage charge contained an onboard unit that recorded roadway usage.
 - > These units communicated with receivers mounted in fuel pumps to pay road usage charges when vehicles were refueled.
 - > This model facilitated the easy refund of gas tax, thus preventing double taxation.

Trial

The ODOT team built a demo system and partnered with local fuel stations to run a trial. Participants were volunteers from the public, and the trial involved actual payments of the road usage charge and refunds of the gas tax paid. The trial found that the technology worked and the system met all of the RUFTF’s policy objectives, but participants had these types of concerns:

- The pay-at-the-pump model was complex and expensive;
- It was “Stuck in time” — it was a closed system that prevented technological evolution;
- Deep concerns about privacy;
- Required use of vehicle location technology;
- Fairness and equity; and
- The system could create a costly bureaucracy.

System Concept of First Oregon Road Usage Fee Trial

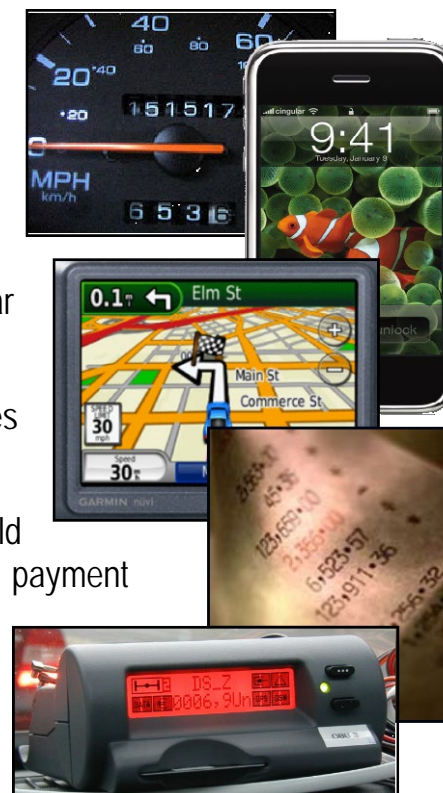


Oregon Road Usage Charge Pilot Program (2008-Present)

After analyzing the results of the first trial, the state Legislature reconstituted the RUFTF with a new set of policy directives designed to overcome issues raised in the first trial.

New Vision. The reconstituted RUFTF committee developed the following new vision for a trial.

- **No technology push.** The government should not mandate or push motorists to particular technologies, especially GPS.
- **An open system.** The system should allow for technologies to evolve with marketplace capabilities and motorist preferences.
- **Private sector administration.** The system should tap into market forces. The system should allow the public to choose either government or private sector provision of data collection and payment services.
- **Motorist choice.** Motorists should have the ability to choose from several collection methods and technologies to meet individual preferences.
- **Focus on vehicles that don't pay their fair share.** Electric and Plug-in Hybrid electric vehicles don't pay for their road use through the gas tax. They should be charged a road usage charge first.



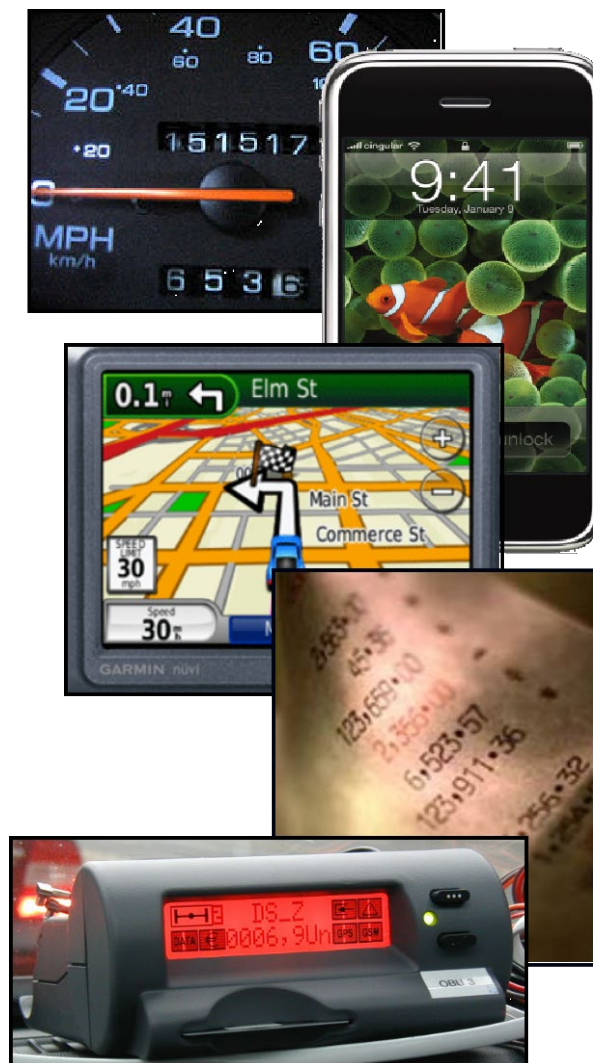
Options Currently Under Study. Based on this new vision, the ODOT team developed the following four road usage charge collection and reporting options:

1. **Electronic Reporting from Odometer.** Wireless transfer of mileage data from vehicle odometer with a basic on-board unit.
2. **Electronic Reporting from Location-Based On-board Unit.** Wireless transfer of mileage data from on-board unit with vehicle location capability (Advanced On-board Unit). This device could be (1) a dedicated, stand-alone device; (2) a user-provided wireless device such as a smart phone; or (3) in-vehicle telematics system, such as GM's OnStar, Ford's Sync, or Toyota's Entune.
3. **Flat Annual Tax.** Purchase unlimited mileage for one year.
4. **Pay-as-you-drive.** Purchase mileage in blocks (Still under consideration, details not determined; not yet approved by RUFTF).

Oregon Road Usage Charge Pilot Program (2008-Present), (continued)

Moving forward with a new Pilot Study. A Request for Expressions of Interest was issued in February 2012, which received responses from 28 companies wishing to support a pilot. All 28 firms were invited to respond to a Request for Proposals, which issued in March 2012. Seven firms were chosen as suppliers for pilots. ODOT now has two firms under contract to support a trial, tentatively scheduled to start in November 2012. Mileage fees for the trial will be set at 1.56 cents, equivalent to the gas tax paid by a vehicle of average fuel efficiency in 2011.

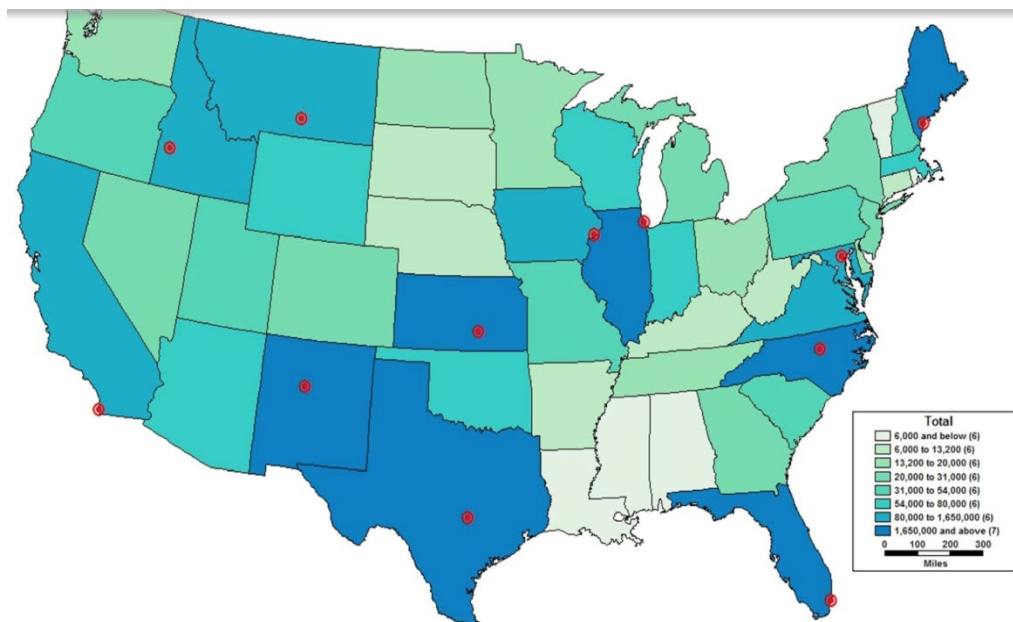
Legislative initiatives. Legislative activities are also ongoing in Oregon. A bill was prepared during the 2012 legislative session but did not make it to vote. ODOT expects that the bill will be brought up in the 2013 legislative session. This bill could mandate that the Oregon Road Usage Charge become law and begin operation as early as 2015 for a subset of vehicles (either Electric and Plug-in Hybrid Electric vehicles, or for vehicles getting gas mileage greater than a certain threshold).



University of Iowa Field Trials (2008-2010)

Professors David Forkenbrock and Paul Hanley at the University of Iowa published groundbreaking road usage charge policy studies in the early 2000s. Later the University received a Federal grant to run a major field trial of a road usage charge.

- 2 years (2008-2010).
 - 2,650 participants from 12 different regions.
 - GPS-based on-board unit, recorded total miles driven in each state by participants.
 - Per-mile charges varied by state / municipality and vehicle class.
- > There were 20 vehicle classes. Differences between classes were based on EPA fuel consumption and emissions data.
- > Charges ranged from 0.33 cents to 2.19 cents per mile (\$0.0033-0.0219).



Total Miles Traveled by Participants During University of Iowa Study by State in Which Miles Were Driven, 2008-2010.

Throughout the trial, researchers surveyed participants on their opinions of the system. They found that participants' opinion of the system improved over time. In general, those who were initially undecided or neutral towards the system became favorably disposed towards it.

Survey Time	Opinion of Road Usage Charging		
	Favorable	Undecided / Neutral	Unfavorable
Pre-trial	42%	41%	17%
Post-trial	70%	11%	19%

On-Board Unit Used in University of Iowa Field Trials



Minnesota Research and Trial (2004-2011)

In 2004, Minnesota DOT (Mn/DOT) began studying road usage charges and commissioned a small trial with the following characteristics:

- It had 100 participants; and
- It was a trial of pay-as-you-drive insurance and pay-as-you-drive car leasing — not, strictly speaking, a road usage charge.

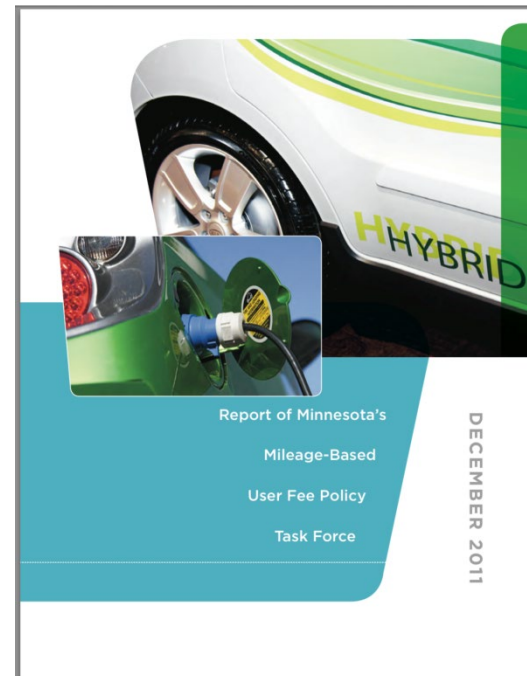
The results of the 2004 trial were:

- Per-mile charging is feasible;
- If the public perceives it benefits from the service, per-mile charging is acceptable to the public; and
- High per-mile charges reduce the number of miles traveled.

In 2009, the University of Minnesota Humphrey School of Public Affairs completed a policy study found that road usage charges are more equitable and sustainable than fuel taxes.

Also in 2009, MnDOT published a report on outreach related to road usage charging, including 19 focus groups, and 821 surveys, coming to the following conclusions.

- Understanding of the transportation funding crisis is low among the public, and understanding of road usage charges is low among the public. Both concepts must be explained to the public in any road usage charge project if it is to be successful.
- Initially, the public tends to favor non-technology options for paying road usage charges.
- Agencies should anticipate initial reservations from the public, as a natural reaction to change.
- Agencies should emphasize that road usage charging is similar to the gas tax in that it is 'pay for use'.



Minnesota Research and Trial (2004-2011) (continued)

- Uncertainty breeds apprehension. Agencies should wait until they have a substantially developed model to create communications to the public.
- Effective communication is important to success.
- A staged road usage charge implementation plan is preferable to a plan that calls for the full system to be turned on at once.
- The public needs to have the opportunity to learn about details at their own pace.

These earlier studies led the way to a 2011 report by a state Legislature sponsored Mileage-Based User Fee Task Force. The Task Force found that a mileage-based user fee or road usage charge was:

- Desirable for revenue sustainability;
- Equitable to different groups;
- Technically feasible; and
- But not without challenges.

Current Minnesota Trial (2010 to present)

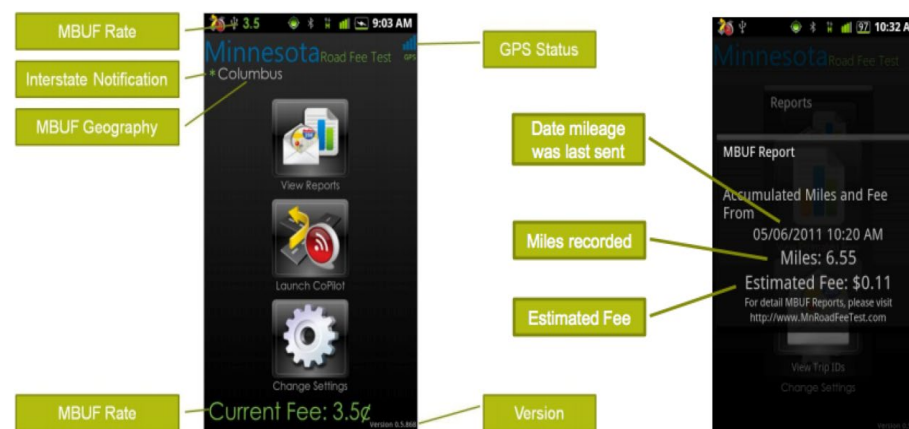
The Task Force work and Federal grant led to Mn/DOT's current trial, called a 'Road Fee Test'.



- It has 500 participants.
- The trial ends December 2012.
- Charges are based on distance traveled within given areas (or zones).
- The per-mile charge rate varies by time of day and zone (but not by vehicle class).
- Each participant was given a Samsung Galaxy II GPS-enabled smartphone.
- The smartphones feature value-added services in addition to being able to record road usage. These services include navigation and in-vehicle signage (showing nearby road signs on the phone display).
- During a "Baseline Period" at the start of the trial, only the navigation and in-vehicle signage applications were enabled. During the test period, the road usage charge part of the program is enabled.
- Data from the smartphones is collected by a central system that stores mileage data and bills customers.

In addition to the smartphone, participants install an electronic device called a **dongle** into their car's electronics "OBDII" port. When the smartphone is not present, the dongle records the mileage traveled. When the phone is returned, the mileage is transmitted to the user's account through the smartphone.

This is a **"thick client"** service, meaning that drivers' location data is never transmitted outside the phone. This gives drivers greater reassurance that their privacy is not being violated.



Smartphone Display in Current Mn/DOT Trial

I-95 Corridor Coalition Study and ConOps (published 2012)

The I-95 Corridor Coalition is a coalition of eastern states that include I-95, ranging from Florida to Maine. In 2009, the Coalition launched a study effort to determine the feasibility of a road usage charge in a multistate environment.

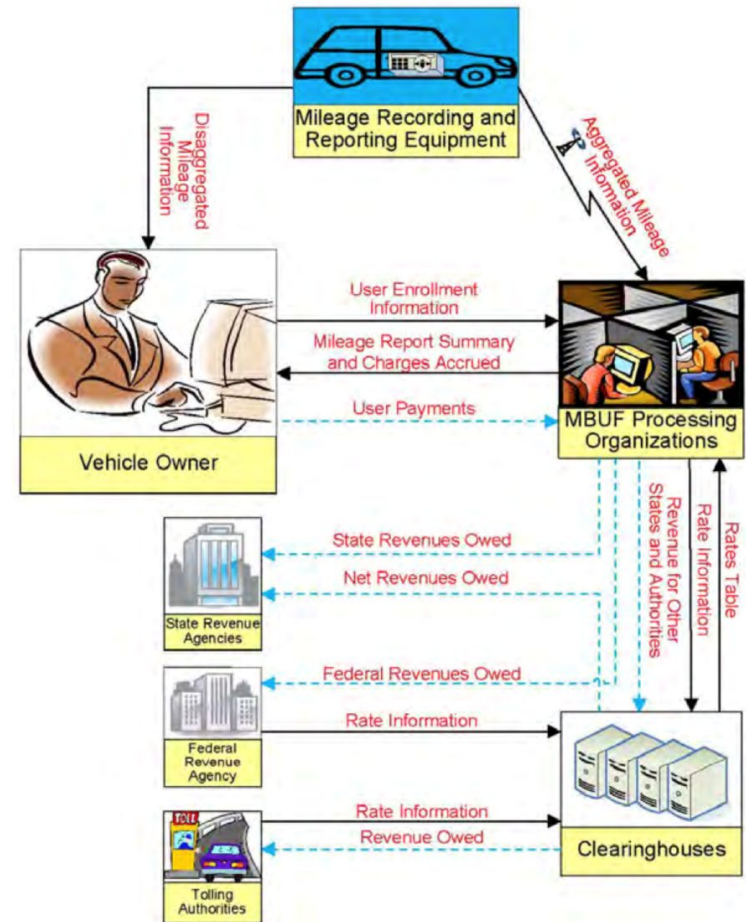
The study resulted in a high-level concept of operations for a multistate road usage charge, concluding:

- Road usage charges are feasible in a multistate context; and
- There are significant institutional issues that are present in a multistate context that must be handled through a back office or central system.

The proposed high-level system architecture is pictured at right. The architecture features:

- **MBUF** (Mileage-Based User Fee, another expression for road usage charges) **Processing Organizations**, which run the road usage charge program directly with clients; and
- **Clearinghouses**, which distribute the mileage rates and clear revenues between states.

Architecture of I-95 Corridor Coalition
Multistate Charge Clearing



Nevada Vehicle Miles Traveled Fee Study (2009-present)

Since 2009, the Nevada Department of Transportation (DOT) has investigated road usage charges as a possible way to shore up sinking gas tax revenues. In the first phase of the trial, Nevada DOT performed a policy study and held two large public meetings. The meetings showed that there was great public interest in the program, but concerns about privacy were very strong.

The Phase 1 report included an extensive policy discussion on:

- **The privacy issue.** They felt that privacy was not an insurmountable issue, but that legal privacy protections were vital. For example, they proposed that a good model for privacy protection legislation was the Federal government's Health Insurance Portability and Accountability Act of 1996 (HIPAA).
- **How to set the per-mile rates,** and determine what per-mile rates should be in various localities, including theoretical economic modeling.

Now the program may be on hold while the Governor appoints a new head of Nevada DOT.

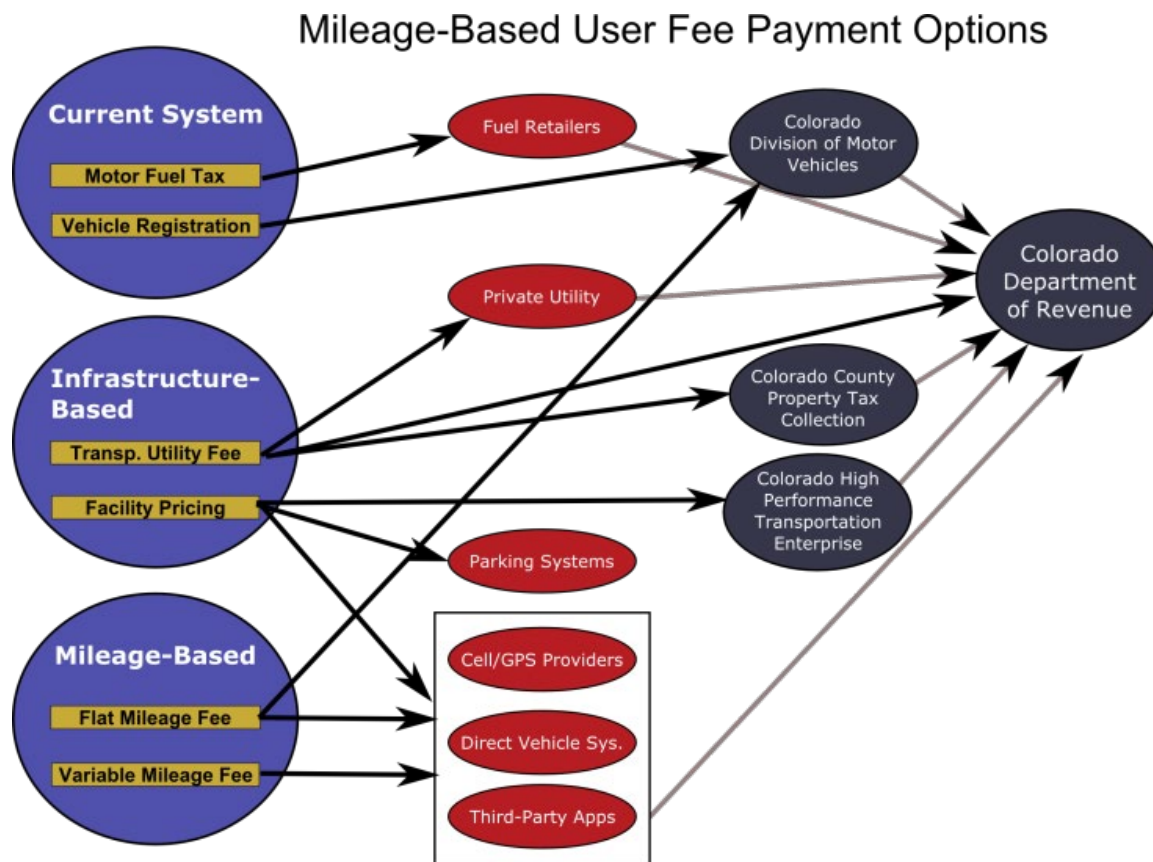
Colorado Mileage-Based User Fee Study (ongoing)

Since 2008, Colorado has been examining ways to cope with a fall in gas tax revenues. The work involves:

- The Colorado Department of Transportation; and
- MOVE Colorado, an organization of private industry interested in state transportation funding.

The group has done policy analysis and assessed different funding options, illustrated in the figure at right.

The group plans to perform a concentrated public outreach effort and run a pilot. The group plans to decide next steps by October 2012.



Regional Planning Studies in California (2008 to present)

California has no large-scale state-level activities on road usage charges, but the Los Angeles region and the Bay area have begun their own studies.

In the **Los Angeles region**, the Southern California Association of Governments (SCAG), an association of counties surrounding and including Los Angeles, commissioned a study to look at congestion reduction and revenue generation alternatives for the region.

- The study looked at many road pricing alternatives, including HighOccupancy Toll (HOT) lanes, congestion charging, traditional toll roads (facility pricing), corridor pricing, emissions pricing, parking pricing, and road usage charging.
- The study found road usage charges to be the most effective way to reduce congestion, and the most cost-effective way to generate revenue, when compared with HOT lanes, cordon charges, and other transportation alternatives.
- The final report is not complete, but is expected soon.

San Francisco Bay Area. The San Francisco Metropolitan Transportation Commission (MTC) proposed a study of a road usage charge in July 2012 as one part of a larger long-range study of transportation funding options.

The announcement attracted a significant amount of media attention and many voices in opposition to the concept of a road usage charge. The opposition was in part caused by a statement made to the media that prices could be as high as 10 cents per mile. This event illustrates the need to be very careful with public statements about a road usage charge, and plan ahead for public relations efforts, even in very early stages, in order to avoid the effects of negative press.

Puget Sound Regional Council Traffic Choices Study (2002-2008)

In 2008, the Puget Sound Regional Council (PSRC) published their Traffic Choices Study, based on a trial of GPS-based tolling of roads.

- The trial ran July 2005 through February 2006.
- Tolls were charged on major surface roads and highways, as indicated by the white and green roadways in the figure, respectively.
- Tolls varied by type of roadway and time of day / day of week.
- 275 volunteer households participated in the study, using GPS onboard units in their vehicles.
- Participants were incentivized to cut back on driving. They were given an account with money for toll payment. If money remained in the account at the end of the study, participants were allowed to keep the money.

The study concluded that:

- GPS tolls can significantly reduce traffic congestion and raise revenues for investment;
- Satellite-based toll systems are mature and reliable;
- A large-scale U.S. deployment of a GPS-based road tolling program will depend on
 - > Proven systems;
 - > A viable business model; and
 - > Public acceptance of underlying concepts.



Section 8:

Technology Options and Considerations

Overview

Technology allows road usage charge policies to be implemented. More detailed identification of where and when driving takes place requires more sophisticated technology. However, as the New Zealand experience demonstrates, road usage charges are possible with little or no technology.

Manual Systems. In early systems such as the European vignettes and the New Zealand RUC, only manual technology was available. Manual systems mean reading the odometer to record mileage, combined with enforcement by an officer who verifies that a paper license is present in the vehicle.

Wireless Tag and Reader Systems. Wireless Tag and Reader systems emerged in the late 1980s for electronic tolling, and was used for road usage charging applications in Hong Kong and Singapore. However, these systems covered limited geography, and would be difficult to carry out over citywide, statewide, or countrywide geographies.

Global Positioning Systems. GPS emerged as a viable, cost-competitive option in the late 1990s and was used in most of the trials conducted over the last 15 years.

Location-based technologies use GPS to determine vehicle location, and include stand-alone devices, smartphones, and in-vehicle telematics.

Non-location-based technologies. Non-location-based technologies are technologies that record and potentially transmit data about miles traveled. With the standardization of the automotive industry's OBDII port in 2004 and the arrival of pay-as-you drive insurance, these technologies have become cheaper and more common.

Each of these technologies, and their application to road usage charging, is explained in this Section.



Manual Technologies

When applied to road usage charges, manual technologies refer to simply reading the vehicle odometer to determine miles traveled.



- Proof-of-payment is made through a sticker in the vehicle's windshield.
- Enforcement activities are manual. Enforcement occurs at annual inspections and / or random police stops.
- Examples include European vignette systems and the New Zealand paper-based road usage charges.
- Main advantage: manual technology is simple and does not arouse privacy concerns.
- Disadvantages:
 - > Perfect enforcement is hard to achieve, leading to greater revenue leakage and higher enforcement costs; and
 - > Payment (and hence agency revenues) may only occur once per year for each vehicle. This can lead to cash flow issues for people of limited means.

Odometer Fraud is Not a Major Concern

Odometer fraud is extremely difficult or impossible on recent-model vehicles. In vehicles built in the last 10-15 years the odometer value is stored in the engine control unit, an onboard computer that has very tight security measures.

Odometer Accuracy Varies More Than One Might Believe

- Owners of vehicles subject to a road usage charge may be concerned about odometer accuracy. Concerned owners may feel that their odometers are inaccurate and they are thus paying too much road usage charges.
- Odometer accuracy on private vehicles typically varies +/- 2.5% from the actual value driven. Individual vehicles may exceed these values, especially in areas where icy conditions are common.

Wireless Tag and Reader Systems

Wireless tag and reader systems (called Radio Frequency Identification Technologies [RFID], and more recently called Dedicated Short-Range Communication [DSRC]), is a simple form of wireless communication that emerged in the 1980s and is commonly used in toll tags.

- The use of tag / reader systems is limited to areas where deployment is technically and financially feasible.
- A single tolling point involves a set of technologies that never cost less than \$100,000 per location. A tolling point can cost much more, depending on the number of lanes to cover and the roadway geometry of the location.
- RFID / DSRC tags now cost as little as \$1.50 for the new 18000-6C tags (WSDOT has recently converted to 18000-6C sticker tags). Traditional “hard-case” tags like EZ-Pass cost about \$10.
- The main locations where RFID / DSRC installations have been employed for road usage charges are Hong Kong and Singapore.
- Main advantage: tags and readers are a well-proven revenue collection and enforcement technology.
- Disadvantages:
 - > The use of tags and readers is limited to the area where readers are installed; and
 - > Tag / reader systems have a large overhead cost of operations.



New 18000-6C Tags

Location-Based Road Usage Charge Technologies (e.g., GPS)

Location-based technologies are technologies that compute road usage charges based on a vehicle's travel in specific locations.

- Location-based technologies are typically based on GPS.
- Location-based technologies are the standard for use in road usage charging trials and studies.

Advantages:

- They support road usage charges on all roads without expensive roadside infrastructure, so cost less than other technologies at a large scale.
- Unlike non-location-based options, they allow easy refund of out-of-state travel or travel on private lands.
- They allow more complex pricing structures, including different pricing for different zones, and congestion charging.

Disadvantage #1: Some members of the public perceive them as intruding on an individual's privacy. There are, however, some privacy reassurance measures that can be taken:

- "Data anonymization" technologies that guarantees location data cannot be associated with an individual's record;
- Techniques by which all location data is contained in in-vehicle electronics and cannot be transmitted to outside facilities;
- Rigorous privacy policies; and
- Requiring all location-based services to be offered by private companies instead of the government.

However, privacy is likely to remain a big concern. Ways to address these concerns include providing a manual system alternative or an opt-in approach to the location-based services that lets drivers use the GPS when they travel out-of-state in order to get a refund.

Disadvantage #2: GPS can be inaccurate due to signals bouncing off of tall buildings in dense urban areas (called "urban canyons"). Several technical solutions exist for this problem.



Types of Location-Based Technologies

Stand-alone or dedicated location-based road usage charge technologies are devices whose sole purpose is to compute road usage charges based on location.

- These technologies require an additional power source (need to be wired into the vehicle).
- They are fairly expensive (\$200+).
- They may not be of a convenient or aesthetically-pleasing form factor.
- Examples of these devices are truck-tolling devices used in various European countries.



Wireless mobile location-based devices include smartphones that feature GPS.

- They require a backup system to be installed in a vehicle that operates when the user forgets or does not have sufficient charge in the mobile device to record the road usage charge.
 - > E.g., a dongle similar to the non-location-based technologies described further in this Section.
- The advantage of these devices is that the user provides the main hardware for recording the road usage charge.
 - > They are more convenient and comfortable for the user.
 - > They are less expensive for the agency operating the road usage charge.



Types of Location-Based Technologies (continued)

In-vehicle telematics are systems offered by auto manufacturers that provide navigation and other features.

- Examples include GM's OnStar, Ford's Sync, Nissan's Carwings, and Toyota's Entune.
- The installation of a road usage charge application on these devices will generally require approval from the auto manufacturer / system provider. So far, automakers have not shown great interest in supporting road usage charges.
- Advantages:
 - > Provides the overall smoothest experience for the driver;
 - > Requires no additional hardware to be added to the vehicle; and
 - > Has no hardware and minimal software costs.
- Disadvantages:
 - > Automakers are concerned about the implications of road usage charges for their sales and may not be willing to support such programs; and
 - > Many vehicles do not have in-vehicle telematics.



Non-Location-Based Road Usage Charge Technologies

Non-location-based technologies are technologies that measure distance traveled using information from the vehicle's electronics.

- These technologies do not include any location-determination technology such as GPS that detects or records location information.
- They plug into the vehicle's tester port or OBDII port (OnBoard Diagnostics II)¹⁰, which has been required on all vehicles since 1996.
- The OBDII port provides a limited amount of data from the vehicle's electronics.
- The OBDII port does not provide the readout of the odometer as a standard value.
- Some OBDII ports provide special values that allow the distance traveled to be accurately calculated.
- All vehicles' OBDII ports provide the vehicle speed signal, which allows the distance traveled to be calculated to a reasonable degree of accuracy.



OBDII port dongles, such as Progressive's snapshot dongle, pictured at right, are small pieces of hardware that contain an electronic interface to the OBDII port and a wireless transmission device such as a cellular modem or Bluetooth connection.

The most common kind of OBDII dongle is a unit for collection of pay-as-you-drive (PAYD) insurance such as the Progressive Snapshot, which is widely advertised on national television. The same dongle could provide road usage charge data. An insurance company could provide the dongle for free, as it does for PAYD customers, and allow dual use of the data to be used for road usage charge payment.

A road usage charge system can support individual vehicles using a mixture of location-based and non-location-based technologies. With a location-based technology, users may be given the option to accrue miles without location information, and switch on location information when they need to, such as when they travel out-of-state.

¹⁰ The OBDII port is an electronic interface roughly ½ inch by 2 inches wide and is found on the driver's side of the vehicle underneath the steering column, near the driving pedals. The precise location of the port varies from model to model.

Section 9:

Lessons Learned for Washington

Lessons Learned: Policy

General Policy

- Policy objectives drive every other aspect of the program, from technology to communications.
 - > Simpler objectives tend to allow for greater flexibility in developing policy alternatives, technology alternatives, operational concepts, communications strategies, and stakeholder engagement.
 - > Adding multiple and / or secondary objectives tends to fix technologies and policies, which may create opposition, as seen in other U.S. states that have studied road usage charging, and internationally in the UK, the Netherlands, and Hong Kong.
- Road usage charging is not tolling.
 - > Although road usage charges are often associated with electronic tolling, the technological, financial, and institutional needs of an organization implementing and operating road usage charges are different from the corresponding features of a tolling entity.
 - A tolling entity interfaces only with customers who use the facility by choice; on the other hand, a road usage charge program must interface with all customers who travel within a jurisdiction with a tax-liable vehicle.
 - Tolling agencies collect money at the time of travel or before; road usage charge administrators may also collect money before or after the road use occurs.
- Light vehicles (cars) and heavy vehicles (trucks) are not the same.
 - > In country after country, program after program, attempts to integrate car and truck road usage charging policies invite opposition from one group or the other.
 - > Light vehicles (cars) and heavy vehicles (trucks) are best treated distinctly with regard to policy, technology, and administration.
 - > New Zealand offers a unique case study of partly integrated administration, but technology and policy remain distinct.

Lessons Learned: Policy (continued)

Revenue-Impacting Policies

- Rate-setting is a stumbling block.
 - > If rates are proposed or decided early in the scheme evaluation and design process, they can undermine public support.
 - > Rates ultimately must be set, regardless of *how* they are collected. The rate-setting debate is likely to be more constructive if policy makers agree on collection methods and alternatives first.
 - > Simpler, flatter rates with clear links to objectives (i.e., revenues) are more likely to be acceptable.
- Double taxation emerges as an issue again and again.
 - > This emphasizes the importance of considering the possibility of and methods for processing gas tax refunds for motorists subject to road usage charges during a potential transition phase.
- Fuel taxes are here to stay. The tremendous revenue opportunity combined with the ease and low cost of collection suggest, and experience confirms that, despite some very real, current flaws with fuel taxes, they are here to stay for at least several decades.

Technology-Impacting Policies

- Flexible systems do not exclude future options and evolutions. Throughout the design and implementation of a road usage charge, system flexibility is of great importance, since policy objectives may evolve based on the changing state political and financial landscape. Well-designed systems offer flexibility and expandability at little or no cost.
- Interoperability is a political issue in addition to a technical issue. The prospect of multiple devices and / or accounts to accomplish similar activities (e.g., road usage charges and tolls) is a common frustration to users.

Lessons Learned: Policy (continued)

Equity

There are a variety of dimensions to policy objectives related to equity, making any discussion of equity more than simply communicating the linkage between who pays and who uses roadways. Considerations may include:

- Fairness among distinct types of users.
 - > Use varies by vehicle type, vehicle energy source (e.g., hybrid, electric), etc.
 - > Rural and urban motorists' travel patterns differ from one another.
- The use of revenues generated.
 - > Revenues could be directed for specific uses (e.g., projects), or modes (e.g., roadway only, roadway and transit), etc.
 - > Receipts could be dedicated to transportation as opposed to a general fund.
- Preventing evasion is another element of fairness.
 - > Evasion may occur inadvertently through equipment malfunctions or tax processing errors.
 - > Evasion may be intentional due to equipment tampering or fraud.
 - > Refunds may be necessary due to billing disputes or administrative and technology errors.

Lessons Learned: Technology

Manual Approaches

- Manual collection of road usage charges is a tested alternative.
 - > As shown in the New Zealand system, the use of manual odometer reading is a feasible way to collect road usage charging.
 - > Manual systems can either be a first step towards more sophisticated systems, and / or remain as an option for drivers that do not want to use high-technology approaches, for whatever reason.

Automated Approaches

- As shown by the current Oregon 2012 trial and the New Zealand experience, non-location-based technology can be used to support road usage charge collection — and they can mitigate the privacy concerns introduced by location-based technologies.
- Automatic License Plate Recognition (ALPR) can be used for enforcement in limited areas. European commercial vehicle road usage charges use ALPR enforcement successfully.
- Personal wireless technology is a tested option for the collection of road usage charges. As shown in Minnesota and Oregon, smartphones and other personal wireless devices can be employed to support road usage charge collection. Members of the public generally find their own devices to be familiar, convenient, and comfortable — and therefore acceptable.
- GPS is a feasible and accurate technology to use for computing road usage charges. However, GPS scares some people who react negatively to the idea that government can track their movements, even if the systems have protections in place to keep that information secure.

Lessons Learned: Technology (continued)

Open Systems

- Open standards are useful for keeping technology features up-to-date and prices down.
 - > Open standards, such as a common message format to a central system for transmission of mileage information, is a key step in ensuring that any technology used in a road usage system is up-to-date, and that competition between vendors is strong.
 - > To ensure an open system operates correctly, an independent certification entity is typically needed to verify that hardware, software, and services are compliant with the open standard.
- Customers want choices in technology. This holds true for technologies used for payment of road usage charges.
- Value-added services are attractive features to many customers and can provide an ancillary revenue stream to vendors. As demonstrated in New Zealand and in the Minnesota pilot (and envisioned in the Oregon 2012 pilot), companies collecting road usage charges can offer value-added services as a way to increase revenues and attract and retain customers.

Transition

- A “big bang” conversion to road usage charging has never happened.
 - > The larger the program, typically, the larger the organization of opposition to oppose the concept no matter its merits.
 - > All existing road usage charge programs moved in small, evolutionary steps rather than large, revolutionary leaps.

Lessons Learned: Organization

- In the U.S., implementation of road usage charging is most likely to occur at the state level and not the Federal level.
 - > Based on the reluctance of Federal legislative and executive leadership on this issue, contrasted with the proliferation of studies and trials among the states and even regional agencies, it is likely that road usage charges will follow so many other policy patterns (including fuel taxes) by starting at the state level years before national adoption.
- Opportunities exist for both the public and private sectors to operate road usage charge programs.
 - > While ownership of the policy must remain with governing authorities, transaction processing and account management are proven both as public (e.g., Eurovignette systems) and private (e.g., New Zealand) operations.
- Public body performance management to support program evaluation.
 - > No matter the level of outsourcing, evaluation of road usage charging almost always accompanies the implementation and operation of the system.

Lessons Learned: Attitudes / Acceptance

Baseline Perceptions and Understanding

- There exists a lack of public understanding about transportation funding generally, the scale of the problem, and what it means nationally and for Washington State.
 - > The public doubts the need for road usage charges due to the many different transportation-related fees in place. For example, motorists in Washington pay state, Federal, and local fuel taxes; vehicle registration and licensing fees; tolls; and general taxes, such as sales taxes. Road usage charges may seem unnecessary or duplicative given the multitude of existing fees.
 - > The public is unaware of or doubts the link between road-related taxes and transportation spending. Because State funds from other taxes can be reallocated, the public may doubt whether all road taxes go to road spending.
 - > The road usage charging concept is often confused with congestion pricing — another new concept for many people.
 - > Confusion may also occur with other State transportation funding initiatives (e.g., 2003 and 2005 investment packages, HOT lanes, etc.).
- Perceptions about the Washington State road usage charge assessment may be influenced by a number of factors, such as:
 - > The level of transparency with the public and the State;
 - > Opportunities for public engagement;
 - > Potential changes in administration and political leadership (in Washington State and nationally);
 - > An informed media and the accuracy of their reporting; and
 - > Vocal constituencies.
- The study parameters will help to shape public perceptions.

Lessons Learned: Attitudes / Acceptance (continued)

Consumer Privacy Expectations

- Protection of personal travel information is a major public concern. Current motor fuel taxes are anonymous. The types of road usage charging that capture the public imagination use GPS technology that appear to allow government to track where and when you travel. When designing road usage charge systems, the features must be evaluated to address issues such as:
 - > Type of data actually needing storage, such as specific location and time of travel.
 - > When storing and transmitting data, to what extent is the data safe from unauthorized personnel?
 - > How are location data used? Must movements actually be tracked?
- If the private sector is involved in carrying out a road usage charge system, how will they maintain consumer privacy?

Expected Public Reactions

- Anticipate initial reservations as a natural reaction. Road usage charges are not entirely unknown to the public, but are misunderstood, particularly due to the conflation of congestion charging, truck charging, tolling, and other transportation policies. These preconceived notions lead to reservations in early phases.
- Concerns over “big government” cloud the role that government could play. Government would define and retain ownership of policy objectives. However, opportunities exist for both the public and private sector to be involved in program administration.

Lessons Learned: Attitudes / Acceptance (continued)

Implications of Public Attitudes for Messaging

- Make clear the relationship between road usage charging and gas taxes.
 - > For all that is misunderstood, taxpayers generally understand the purpose of fuel taxes is to pay for roads.
 - > New Zealand's success in adopting road usage charges was due in part to the reduction and ultimate elimination of diesel taxes. Similarly, the proposed Oregon scheme promises gas tax refunds, while truck charging in the UK is predicated on a reduction in diesel taxes.
- Uncertainty breeds apprehension. One of the chief antidotes for uncertainty is flexibility. By insisting on a broad range of alternatives during study phases and, down the road, by emphasizing user choice from a menu of options, apprehension can be mitigated.
- Evaluation is important. Regular evaluation helps to reinforce the linkage between the objectives originally presented and the achievements of a road usage charge system.
- Media sound bites have misrepresented road usage charging, fanning controversy around the concept.
- Implementation will NOT occur tomorrow. Elsewhere, road usage charge programs have progressed slowly over time. Washington's evolutionary approach is consistent with that.

Lessons Learned: Implementation Costs

- The public will object to a system if the perceived cost of operation is too high.
- A cost model can be helpful for analyzing policies under consideration to understand the impact of choices on system costs.
- Leveraging private industry to the degree possible will decrease costs and increase public perception of the road usage charge as being efficient.
- The fuel tax is one of the most efficient taxes that governments collect. A road usage charge should not be expected to match fuel taxes by the “costs as a proportion of revenue” metric, particularly in the early years of operation.
- Economies of scale apply to road usage charges. If the percentage of the vehicle fleet to which the road usage charge applies is small, the costs will be proportionately higher than if it applies to a large percentage of the vehicle fleet. Private industry may not see a positive business case to support a road usage charge applying only to a small number of vehicles, and may require some subsidy to participate.
- Combining road usage charge hardware with hardware used for other services (smartphones, in-vehicle telematics, pay-as-you-drive insurance dongles) tends to decrease costs.

Lessons Learned: Compliance

- A substantial fraction of motorists will comply with tax requirements without enforcement or penalties. However, penalties must be sufficiently high to provide an effective deterrent for noncompliance.
- The precise form of compliance will vary depending on the type of technology chosen to facilitate road usage charge collections.
- Recording odometers at safety inspection, title transfer, and on maintenance records (as required by Federal anti-odometer-rollback laws) can provide an effective backup means of generating compliance.
- There is a trade-off between the cost of enforcement and revenue “leakage” (revenue lost to evasion). Enforcement is generally designed to achieve a minimum baseline level of acceptable compliance. However, the cost of any enforcement system should not exceed the revenue leakage that it prevents.

Appendix A

Engrossed Substitute House Bill 2190 – Supplemental Transportation Budget

For The Transportation Commission

The appropriations in this section are subject to the following conditions and limitations:

(4) \$775,000 of the motor vehicle account--state appropriation is provided solely to determine the feasibility of transitioning from the gas tax to a road user assessment system of paying for transportation.

(a) The transportation commission, with direction from the steering committee created in (b) of this subsection, must: Review relevant reports and data related to models of road user assessments and methods of transitioning to a road user assessment system; analyze the research to identify issues for policy decisions in Washington; make recommendations for the design of systemwide trials; develop a plan to assess public perspectives and educate the public on the current transportation funding system and options for a new system; and perform other tasks as deemed necessary by the steering committee.

(b) The transportation commission must convene a steering committee to provide direction to and guide the transportation commission's work. Membership of the steering committee must include, but is not limited to, members representing the following interests: The trucking industry; business; cities and counties; public transportation; environmental; user fee technology; auto and light truck manufacturers; and the motoring public. In addition, a member from each of the two largest caucuses of the senate, appointed by the president of the senate, and a member from each of the two largest caucuses of the house of representatives, appointed by the speaker of the house of representatives, must serve on the steering committee.

(c) The transportation commission must update the governor and the legislature on this work by January 1, 2013. In addition, this update must include a plan and budget request for work to be completed during the 2013-2015 fiscal biennium.

(5) \$160,000 of the motor vehicle account--state appropriation is provided solely for the transportation commission to establish a statewide transportation survey panel and conduct two surveys on transportation funding and policy issues during the 2011-2013 fiscal biennium. At a minimum, the results of the first survey must be submitted to the legislature by January 2013.

Engrossed Substitute House Bill 2190 – Supplemental Transportation Budget

For The Department Of Transportation--Economic Partnerships--Program K

The appropriations in this section are subject to the following conditions and limitations:

(1)(a) \$225,000 of the motor vehicle account--state appropriation is provided solely to carry out work related to assessing the operational feasibility of a road user assessment, including technology, agency administration, multistate and Federal standards, and other necessary elements. This work must be carried out under the guidance of the steering committee and in coordination with the transportation commission's policy assessment and public outreach planning authorized in section 205(4) of this act.

(b) If subsequent appropriations are provided, the department may conduct a limited scope pilot project to test the feasibility of a road user assessment system to be applied to electric vehicles. The pilot project must be carried out under the guidance of the steering committee described under section 205(4) of this act and in coordination with the transportation commission.