
Oregon Road Usage Charge System

Pre-legislative Concept of Operations Final Draft

Prepared for



June 28, 2013

Prepared by

CH2MHILL®
with D'Artagnan Consulting

Contents

Section

Page

Contents

Document Control Record	v
Acronyms and Abbreviations.....	vi
Executive Summary	1
Background	1
Initial Oregon Mileage Fee Concept Pilot	2
Road Usage Charge Pilot Program (RUCPP).....	2
New Legislation	3
RUC System Vision and Goals	3
RUC System Functions.....	4
1 Scope of Document	1
1.1 Document Overview	1
1.2 Document Format	3
1.3 Definitions and Abbreviations.....	4
1.4 Assumptions.....	7
2 Referenced Documents	8
3 Background	10
3.1 Highway Funding in Oregon.....	10
3.2 Road User Fee Task Force (RUFTF).....	14
3.2.1 Initial Oregon Mileage Fee Concept Pilot	14
3.3 A New Vision and Legislation	16
3.3.1 Road Usage Charge Pilot Program (RUCPP).....	17
3.3.2 New Legislation	25
4 System Needs and Operation Considerations.....	27
4.1 Vision and Goals.....	29
5 User-Oriented Operational Description	31
5.1 System Entities and Stakeholders	31
5.2 System Processes and Functions	33
5.2.1 Acquires and Registers Vehicle	34
5.2.2 Makes RUC Choices.....	36
5.2.3 Driving / Measuring Miles and Invoicing / Payment.....	40
5.2.4 Dispose of Vehicle	42
5.2.5 Other RUC Functions.....	43
5.3 Temporal Considerations	44
6 Operational and Support Environment	48
6.1 Open Architecture Concepts.....	48
6.2 Mileage Reporting Device (MRD) and Vehicle Telematics	49

SectionPage

- 6.2.1 Plug-In MRD 50
- 6.2.2 Vehicle Telematics 51
- 6.2.3 Location-based Differentiation and Reporting 52
- 6.2.4 MRD Processing and Communications 53
- 6.2.5 Other MRD Design Features 54
- 6.2.6 Data Collection 55
- 6.2.7 Manual Mileage Reporting and Other Fallback Options 55
- 6.3 Road Charge Processing and Account Management Operations 57
 - 6.3.1 Transaction Processing..... 58
 - 6.3.2 RUC Invoice and Payment 58
 - 6.3.3 RUC Payer Services..... 59
- 6.4 RUC Accounting (RUCA) 60
- 6.5 System Compliance 61
 - 6.5.1 Education 61
 - 6.5.2 Enforcement..... 62
 - 6.5.3 Audits 63
- 6.6 Privacy 64
- 6.7 Certified Service Providers (CSPs) 66
 - 6.7.1 Certification..... 67
- 6.8 ODOT Organization 70
- 6.9 Evaluation and Performance Measures 73
- 6.10 Context within the National and Statewide Intelligent Transportation System (ITS) Architectures 75
- 7 Operational Scenarios 76**
 - 7.1 Preparatory RUC Accounting Activities..... 77
 - 7.1.1 Identifying Vehicles that are Subject to RUC (Mandated 77
 - 7.1.2 Develop Certification Processes..... 78
 - 7.2 Acquire / Register Vehicle; Make Choice 79
 - 7.2.1 Providing Information on Available Choices 80
 - 7.2.2 RUC Payer Acquires New Vehicle from Dealer 80
 - 7.2.3 Owner / Lessee Desires to Pay RUC (Voluntary)..... 81
 - 7.2.4 RUC Payer Moves into State with Subject Vehicle 82
 - 7.2.5 RUC Payer Changes Desired Choice 83
 - 7.3 Driving / Mileage Collection..... 85
 - 7.3.1 In State on Public Roads..... 85
 - 7.3.2 In State on Private Property..... 86
 - 7.3.3 Out of State 87
 - 7.3.4 Out-of-State Vehicle Driven in Oregon 88
 - 7.3.5 Obtaining Credit for Fuel Tax Paid 88
 - 7.4 Invoicing and Payment..... 89
 - 7.5 Disposal of Vehicle 90
 - 7.5.1 RUC Payer Sells Vehicle to another Person (Private Sale) 90
 - 7.5.2 Vehicle Moved Out of State 91
 - 7.5.3 Vehicle Stolen..... 92

7.5.4	Vehicle Destroyed	92
7.6	Compliance.....	93
7.6.1	Owner / Lessee Does Not Set Up and Account.....	93
7.6.2	RUC Payer Tampers With / Removes MRD.....	93
7.6.3	RUC Payer Does Not Pay	94
7.7	Failure Conditions	94

Tables

Table 1	RUCPP Participant Summary	20
Table 2	RUCPP Goals	23
Table 3	Summary of System Needs and Policy Directives for the Oregon Road Usage Charge System	27
Table 4	Manual Mileage Reporting Process.....	56
Table 5	Potential Performance Measures for the Oregon RUC System	74

Figures

Figure 1	Systems Engineering “Vee” Diagram	2
Figure 2	Flow Diagram of Major Questions the Concept of Operations will answer	3
Figure 3	Oregon Road Revenue Sources.....	10
Figure 4	Percent Change in Vehicle Miles Traveled, Population, Gallons and Fuel Tax Revenues Since 1970.....	12
Figure 5	State and Federal Fuel Taxes on Light Duty Vehicles per Vehicle Mile Traveled	13
Figure 6	Oregon Mileage Fee Concept Pilot Configuration	15
Figure 7	Oregon Mileage Fee Concept Pilot Sample Receipt	15
Figure 8	RUCPP Pilot Schematic (from RUCPP procurement documents)	18
Figure 9	Pilot MRD Options.....	19
Figure 10	Sample RUCPP Invoice	20
Figure 11	Part of MRD Installation Card	21
Figure 12	Summary of Plan Choices (from participant website)	22
Figure 13	Oregon Road Usage Charge Conceptual Configuration.....	34
Figure 14	Installation of MRD in the Vehicle’s OBD-II Port.....	38
Figure 15	RUC Configuration and Subsystems.....	40
Figure 16	Target System Configuration for Day 1.....	46
Figure 17	Ultimate System Configuration.....	47
Figure 18	Example of Vehicle Telematics.....	52
Figure 19	In-Vehicle Telematics Data Aggregation	55
Figure 20	Organizational Framework Model	72
Figure 21	Oregon Mileage Fee Concept Pilot Configuration	76

Document Control Record

Version	Main Changes	Contributions From	Date
V1.0	Annotated Nov 2011 Version of CONOPS	L Neudorff, J. Roberts	April 15, 2013
V1.1	Preliminary Draft	L Neudorff, J. Roberts	April 21, 2013
V2.0	Updated Draft	L Neudorff, J Roberts, using input from C. Larsen and T. Dunn	May 17,2013
V 2.1	Additional updates from May 29 review meeting	L Neudorff	June 10,2013
V3.0	Final Draft	L Neudorff, J. Roberts	June 14, 2013
V3.1	Final Draft with additional of Chapter 7	L Neudorff, J. Roberts	June 17, 2013
V3.2	Meeting to discuss	ODOT, CH2M HILL, D'Artagnan	June 18,2013
V3.3	Mark ups / comments on Final Draft	J. Whitty, C. Larsen, D'Artagnan	June 25, 2013
V4.0	Final	L Neudorff, J. Roberts	June 27,2013
V4.1	Updated Final (New Figure 4)	L Neudorff, J. Roberts	June 28,2013

Acronyms and Abbreviations

This document uses the following definitions and abbreviations.

Term / Abbreviation	Definition/Description	Remarks
ANSI	American National Standards Institute	
CE	Certification Entity	
CONOPS	Concept of Operations	
COTS	commercial-off-the-shelf	
CRM	Customer Relationship Management	
CSP	Certified Service Provider	
DMV	Driver and Motor Vehicle Services Division	
EV	electric vehicles	Vehicle powered only by a form of electricity. There is no internal combustion engine, relying solely on their electrical motor for propulsion
FHWA	Federal Highway Administration	
GPS	global positioning system	
HEV	hybrid electric vehicle	Vehicle powered by both fuel (internal combustion engine) and electricity. The internal combustion engine acts as either a charger for the electrical drive's batteries or as a secondary means of propulsion if the batteries lack the adequate charge.
ICD	interface control document	
ICE	internal combustion engine	
ISO	International Organization for Standardization	
ITS	Intelligent Transportation Systems	
MPG	miles per gallon	
MPGe	miles per gallon equivalent	A measure of the average distance traveled per unit of energy consumed. MPGe is used by the Environmental Protection Agency to compare energy consumption of EVs, PHEVs, and other alternative fuel vehicles with the fuel economy of conventional ICE vehicles expressed as MPG.
MRD	mileage reporting device	
OIPP	Oregon Innovative Partnerships Program	Program administered by ODOT's Office of Innovative Partnerships and Alternative Funding

Term / Abbreviation	Definition/Description	Remarks
ODOT	Oregon Department of Transportation	
PHEV	plug-in hybrid electric vehicle	Vehicle powered by both fuel (ICE) and electric power. The primary means of propulsion for a PHEV is a battery supported electric motor with a petroleum based ICE serving as a secondary means of propulsion and/or battery charging. This is very similar to a HEV, with the major difference being that the PHEV battery may be charged through a connection with an external electrical power.
RFI	Request for Information	
RFP	Request for Proposal	
RUC	Road Usage Charge	The name of the ODOT program to collect a mileage based user fee on the miles traveled by a vehicle.
RUCA	Road Usage Charge Accounting	
RUCPP	Road Usage Charge Pilot Program	
RUFTF	Road User Fee Task Force	
SLA	service level agreement	Part of a contract where the service to be provided is formally defined
SRS	system requirement specification	
VAS	value added services	
VIN	Vehicle Identification Number	

Executive Summary

This document presents the pre-legislative version of the Concept of Operations (CONOPS) for the proposed Road Usage Charge (RUC) system to be deployed throughout the state of Oregon. It describes a system for charging mileage-based fees on the following groups of vehicles:

- Highly fuel-efficient vehicles that pay little or no fuel tax.
- Other vehicles for which the owners / lessees wish to pay the per-mile RUC and have applied to the Oregon Department of Transportation to do so.

This pre-legislative RUC CONOPS represents the third version of a Concept of Operations for the Oregon Road Usage Charge System – the initial CONOPS being prepared in 2011. This current version of the RUC CONOPS reflects the lessons learned from the initial Road Usage Charge Pilot Program (RUCPP) and current policy as reflected in legislation before the Oregon legislature for initial implementation of the RUC system (thus the name “pre-legislative” in the title). While many of the technical and policy issues have been resolved since the development of the first CONOPS, a few still remain.

Background

Vehicles are becoming more fuel efficient. The users of these more fuel-efficient vehicles pay lower fuel taxes at the pump than the preceding vehicle fleet for the same number of miles driven. Moreover, the drivers of the emerging fleet of electric vehicles and plug-in hybrid vehicles will pay no fuel tax or a very small amount. This situation can be further exacerbated by major increases in fuel prices¹, which tend to reduce the total number of miles driven. The combination of a more fuel-efficient fleet coupled with higher fuel prices (and less driving in recent years) has led to a significant drop in fuel tax revenues at the state (including Oregon) and federal levels. A majority of policymakers and industry analysts across the nation now agree that the fuel tax can no longer be relied upon to provide sustainable revenues for improving, operating and maintaining the nation’s roadway infrastructure.

As a strategy to reduce emissions and protect the environment, while also reducing the nation’s dependence on foreign oil, Oregon wants to encourage market penetration of electric vehicles and other highly fuel efficient vehicles. At the same time, however, the state's constitutional requirement for “cost responsibility” means that the owners of these vehicles need to pay a proportionate share of the costs incurred for using the highway system. Making those who use the transportation network pay for that use – the “user pays” principle – appeals to a fundamental notion of fairness widely accepted by consumers in other marketplaces.

The Road User Fee Task Force (RUFTF) was established by the Oregon legislature in 2001 with the mandate to “develop a design for revenue collection for Oregon’s roads and highways that will replace the current system for revenue collection.” In 2003, after considering 28 different funding ideas, the RUFTF recommended a road revenue program that included a studded tire tax, tolling new highway capacity, congestion pricing, and a mileage-based user fee. The RUFTF also recommended that ODOT conduct a pilot program to study the feasibility of replacing the gas tax with a mileage-based fee. ODOT launched an initial 12-month pilot program in April 2006 to test the technological and administrative feasibility of the Oregon Mileage Fee Concept.

¹ An increase in fuel prices generally does not result in an increase in the fuel tax. The federal fuel tax, the Oregon fuel tax, and the fuel tax in most other states is a fixed amount per gallon – not a percentage of the fuel price. Fuel prices fluctuate, but the per gallon fuel tax remains the same unless changed by legislative action

Initial Oregon Mileage Fee Concept Pilot

The 2006-2007 Oregon Mileage Fee Concept Pilot used a pay-at-the-pump model wherein both mileage data and mileage charge collection occurred at the fuel pump. The concept system, which included 299 volunteer motorists (and 285 vehicles) in the Portland area, involved the use of an on-vehicle receiver that accessed signals from the U.S. global positioning system (GPS) to delineate predefined zones. This feature enabled the receiver to determine the location of a vehicle while in motion and record mileage.

One of the first pilot programs of its kind, the Oregon Mileage Fee Concept pilot was universally hailed as a success. Not only did it show that electronic collection of fees based on road usage was viable, it successfully integrated many of the requirements identified for such a new highway revenue system. Some potential issues were also identified. One was the dependence upon a *closed system* for mileage data collection and payment, including application of technology that could become “stuck in time.” Another issue was the public concern regarding privacy – that the use of geo-location technology would enable the government to know where citizens had driven. The perception of large and costly bureaucracy was another concern.

The RUFTF was reconstituted in 2010 with the stated purpose to “consider revenue options for the emerging fleet of electric and plug-in hybrid electric vehicles that will pay no fuel tax or only a tiny amount.” The task force met three times in 2010 to assess the viability of a per-mile charge collection system and to develop draft legislation that would impose a mileage charge system in Oregon, all the while keeping the following lessons learned from the 2007 Road User Fee Pilot Program in mind:

- Make the system simple and easy to use
- Design the data collection and payment system to access existing processes familiar and acceptable to the public
- Provide choices to motorists
- Do not mandate a GPS box for motorists’ cars
- Allow the private sector to provide data collection options and payment options

During the 2011 session, the Oregon legislature enacted legislation, which reinforced the RUFTF to guide and direct ODOT to further develop a system to support the enactment of a road usage charge. That bill—H.B. 2138—also directed the RUFTF to develop recommendations on the design of pilot programs to test alternative approaches for a road usage charge. The legislation led to the development of the Oregon Road Usage Charge pilot Program (RUCPP).

Road Usage Charge Pilot Program (RUCPP)

The RUFTF authorized ODOT to develop and deploy a pilot program system in advance of the 2013 biennium legislative session. The primary goal of the RUCPP was a “feasibility validation” – to demonstrate to the RUFTF, legislators, and other stakeholders that the RUC system goals and objectives could be achieved, the system concepts and features are viable and valid, and the vendor community has the ability to provide and implement the system components required to operate an effective, efficient and open RUC.

The RUCPP, which incorporated technology and services from three private vendors, successfully measured mileage and distributed invoices to 88 participants (people who volunteered to pay the RUC) from three states (Oregon, Washington, and Nevada) over a 3-month period. The RUCPP offered participants several choices for measuring mileage and paying the road usage charge. The mileage reporting technologies and account management functions were provided by multiple vendors from the private sector. ODOT also provided account management services for selected participants. In addition

to the multiple choices offered to the participants, another attribute that made the RUCPP pilot unique and the first of its kind is that the Oregon participants – including members of the state legislature, Oregon State Transportation Commission, Governor’s office, and ODOT executives and staff – actually paid the RUC (at 1.56 cents per mile), less credits provided for any Oregon gas taxes paid and/or miles driven on private property during the pilot.

The RUCPP was deemed a success – it achieved the primary goals and objectives including demonstrating ease of use, motorist choice, accuracy, and an open, interoperable system with significant involvement by the private sector.

New Legislation

HB 2453B was introduced in the 2013 session of the Oregon Legislature. This bill identifies two types of vehicles that will be subject to a road usage charge:

- **Mandatory** – Model year vehicles of 2015 or later with a rating of 55 miles per gallon (MPG) of gasoline or above, or 55 miles per gallon of gasoline equivalent (MPGe) or above.
- **Voluntary** – A motor vehicle that has a rating of less than 55 miles per gallon of gasoline or less than 55 miles per gallon of gasoline equivalent, and for which the owners / lessees wish to pay the per-mile RUC and have applied to the Oregon Department of Transportation to do so. The maximum number of “volunteer” vehicles is 5000.

The legislation excludes motor vehicles designed to travel with fewer than four wheels in contact with the ground (e.g., motorcycles), nor does it include motor vehicles subject to the Oregon weight-mile tax. The RUC is to become operative on July 1, 2015; the rate is currently set at 1.55 cents per mile.

RUC System Vision and Goals

The following vision statement for the Oregon Road Usage Charge System was developed as part of the Preliminary CONOPS, and has been revised slightly as a result of the lessons learned from the RUCPP Pilot and current legislation:

The Oregon Road Usage Charge System vision is a reliable, easy-to-use, low cost, enforceable, and publicly acceptable “open” system that replaces the fuel tax; applying a charge – based on measured road use – to highly fuel efficient vehicles, thereby preserving cost responsibility and providing the means to support the state’s system of roads and highways. The system provides the owners and drivers of these vehicles with choices as to how the charge is measured and collected, is capable of charging for only those miles driven on public roads within the state, and protects the vehicle owners’ and drivers’ privacy. The system also incorporates public-private partnerships to manage the various road usage charge functions and processes.

The vision statement, coupled with the system needs and policy directives, leads to the following RUC system goals:

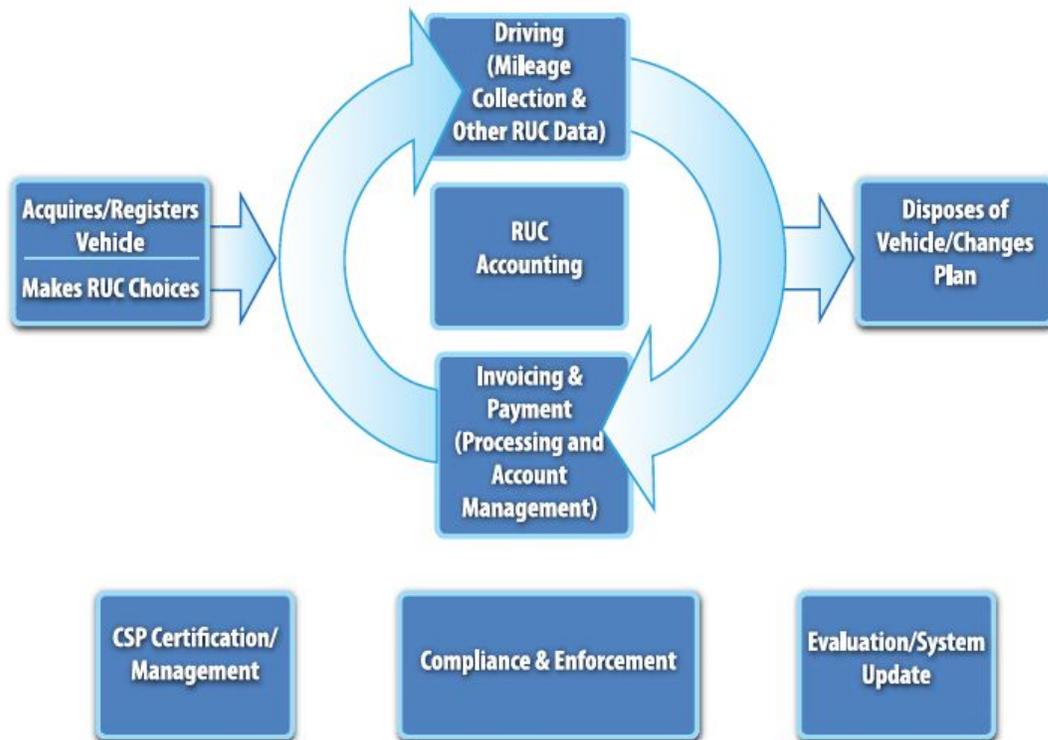
- Implement a **cost-effective and transparent system** for collecting the RUC, one that is highly automated and is easy to use and understand.
- **Provide RUC payers with choices** regarding road usage / mileage reporting and methods for invoicing and payment.
- **Establish public-private partnerships** to develop a system that allows RUC payers to interface with the Certified Service Provider(s) (CSPs) of their choice to report mileage and/or to provide invoicing and payment.

- Implement a **government system as an alternative choice** and “provider of last resort” for basic measuring and invoicing activities.
- **Protect privacy**, including restrictions on the release of personally identifiable information, conditions for how long an individual’s mileage information can be retained, and not mandating location-based charging systems (but allow certified service providers to use location-based charging technology for those travelers who prefer this method of reporting.)
- **Charge Oregon residents only for in-state travel**, unless travelers report mileage undifferentiated by geographic location (in which case, all recorded mileage will be assumed to have been driven within the state).
- Provide **credits or refunds for travel on private property** within Oregon by residents.
- Provide **credits or refunds for fuel taxes paid** for vehicles that are subject to the RUC.
- **Ensure efficient account management operations** that provide a convenient way for taxpayers to access, administer, and make inquiries regarding their mileage-based RUC and the processes by which these charges are calculated.
- **Base the system design on an open architecture using common standards** for the system components that need to be interoperable for an efficient, cost-effective, and market-driven system. This also includes establishing guidelines, defining requirements, and defining a certification process for potential nongovernment third parties that are interested in participating and providing services for the RUC system. It also permits the road usage charge to be a value-added element to other vehicle-related services provided by CSPs.
- **Provide viable audit trail** to ensure proper recording of mileage and associated payments, by RUC payers and CSPs.
- **Promote compliance** through a combination of education, regular audits (and associated audit trail), tamper-proof hardware and software, and enforcement activities to minimize reporting and payment violations.
- Develop a system that will be **compatible with future RUC systems in other states**.
- Develop a system design that does **not preclude future expansion** and/or collection of a variety of transportation charges, including, but not limited to, zone-based charges, facility tolls, and local options.

RUC System Functions

To achieve the vision and goals, the RUC system must accommodate several functions and processes that interact with each other as shown in Figure ES-1.

Figure ES-1
Oregon Road Usage Charge Conceptual Configuration

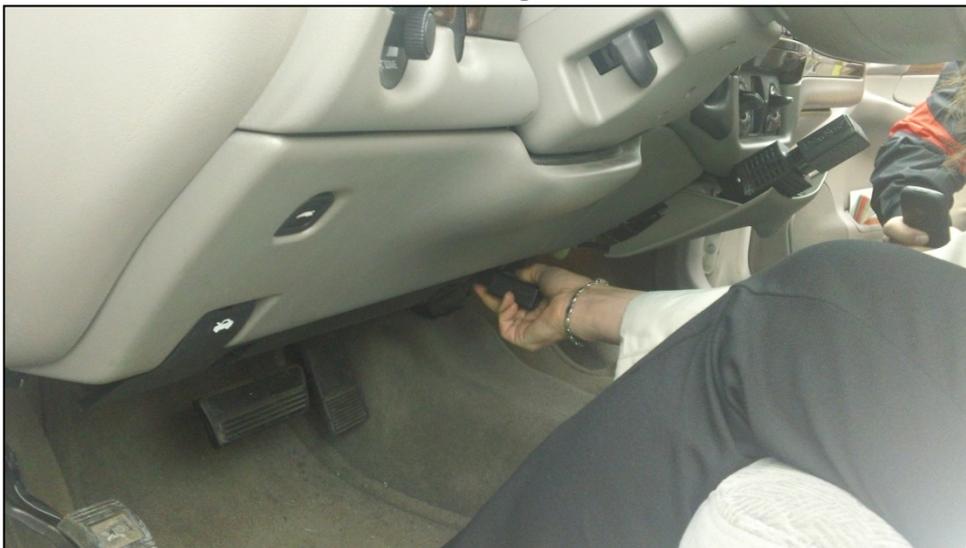


The functions and processes connected with arrows represent the charging process including:

- **Acquires / Registers Vehicle** – Focuses on the processes by which a subject vehicle becomes part of the RUC system. Two types of subject vehicles are included in the current legislation: mandatory vehicles and voluntary vehicles. It is envisioned that the registration process for mandatory vehicles will include an acknowledgement by the owner / lessee that the vehicle is subject to the RUC. The list of those vehicle makes and models that are subject to the mandatory RUC (i.e., model year 2015 vehicles (and beyond) that are rated at 55 MPG or MPGe or greater) will be developed and continually updated by ODOT, with the list made available to DMV and auto dealers throughout the state.
- **Makes RUC Choices** - One of the key system goals is to provide RUC payers with choices regarding road usage / mileage reporting and methods for invoicing and payment. It is currently envisioned that the RUC payer will need to choose a mileage reporting method and set up a RUC account – and to notify ODOT of these choices – within a stipulated (by rule) period of time following registration. The choice process will involve several steps and options including:
 - **Mileage Reporting Method**
 - Undifferentiated Mileage (basic mileage reporting device [MRD]) with no location (GPS) capability. All mileage is assumed to be driven in Oregon and subject to the RUC.
 - Differentiated Mileage (advanced MRD) with GPS or other location capability, thereby allowing the RUC payer to differentiate mileage by “in Oregon” (and chargeable) and “out of Oregon” (not chargeable). No location information is sent to ODOT; only the total number of miles driven and those miles driven in Oregon.

- Switchable MRD – a basic mileage reporting device that also allows the driver to switch to advanced (location-based) operation through the use of the GPS capability of a Smartphone or similar device and a RUC “app”. This would allow RUC payers to use an undifferentiated approach when driving in Oregon, but then “switch” to a differentiated approach when driving out of state, if so desired.
- Flat Annual RUC – HB 2453B permits a registered owner or lessee of a subject vehicle to pay a Flat Annual RUC in lieu of paying a per-mile charge. The Flat Annual RUC is an amount equal to the product of 1.55 cents multiplied by 35,000 miles. No credit or refund for any gas taxes paid is provided under this approach (as is the case with the other choices noted above.)
- **Mileage Reporting Technology**
 - RUC-specific MRD – A device dedicated solely to the reporting miles and fuel consumption for the RUC (as was used in the 2012 – 2013 pilot) and that plugs into the vehicle’s diagnostic port as shown in Figure ES-2.
 - Multi-function MRD – A plug-in device that has a primary function other than RUC (e.g., pay-as-you-drive insurance), but RUC is included as a value added feature.
 - Factory installed Telematics – This technology approach does not use any external device plugged into the vehicle’s diagnostic port as was done for the pilot. The data and other information required for road usage charging will be provided via the vehicle’s internal telematics. Examples of factory-installed telematics include GM’s OnStar, Ford’s Sync, Mercedes’ Embrace, or Toyota’s Entune. With this long term approach, RUC would become a value added to these existing services.

Figure ES-2
Installation of MRD in the Vehicle’s Diagnostic Port



- **Account Management**
 - Private entity that has been certified to provide account management services for the RUC system. It is envisioned that these account management CSPs will provide additional services – not just the RUC. In fact, the RUC may be another value-added service already provided by the CSP (e.g., PAYD insurance, traveler information, concierge services)

- ODOT will also provide account management services under certain circumstances (e.g., for RUC payers who choose a Basic MRD and who do not want a private entity to manage their accounts; for RUC payers who cannot qualify for a CSP account; RUC payers who chooses the Flat Annual RUC)
- **Driving / Measuring Miles and Invoicing / Payment** - Once the RUC payer makes the necessary choices and sets up the RUC account, the on-going process of driving, measuring miles, invoicing, and paying the RUC will continue for as long as the RUC payer remains an Oregon resident and owns or leases the subject vehicle.
- **Dispose of Vehicle** - The processes of driving and measuring / reporting miles, and subsequent invoicing and payment continues until the RUC payer disposes of the subject vehicle (e.g., the lease expires or the vehicle is sold) or moves out of state. A RUC payer may also end voluntary participation in the RUC program at any time by notifying ODOT and paying any outstanding amount of the RUC for metered use by the person's voluntary vehicle.

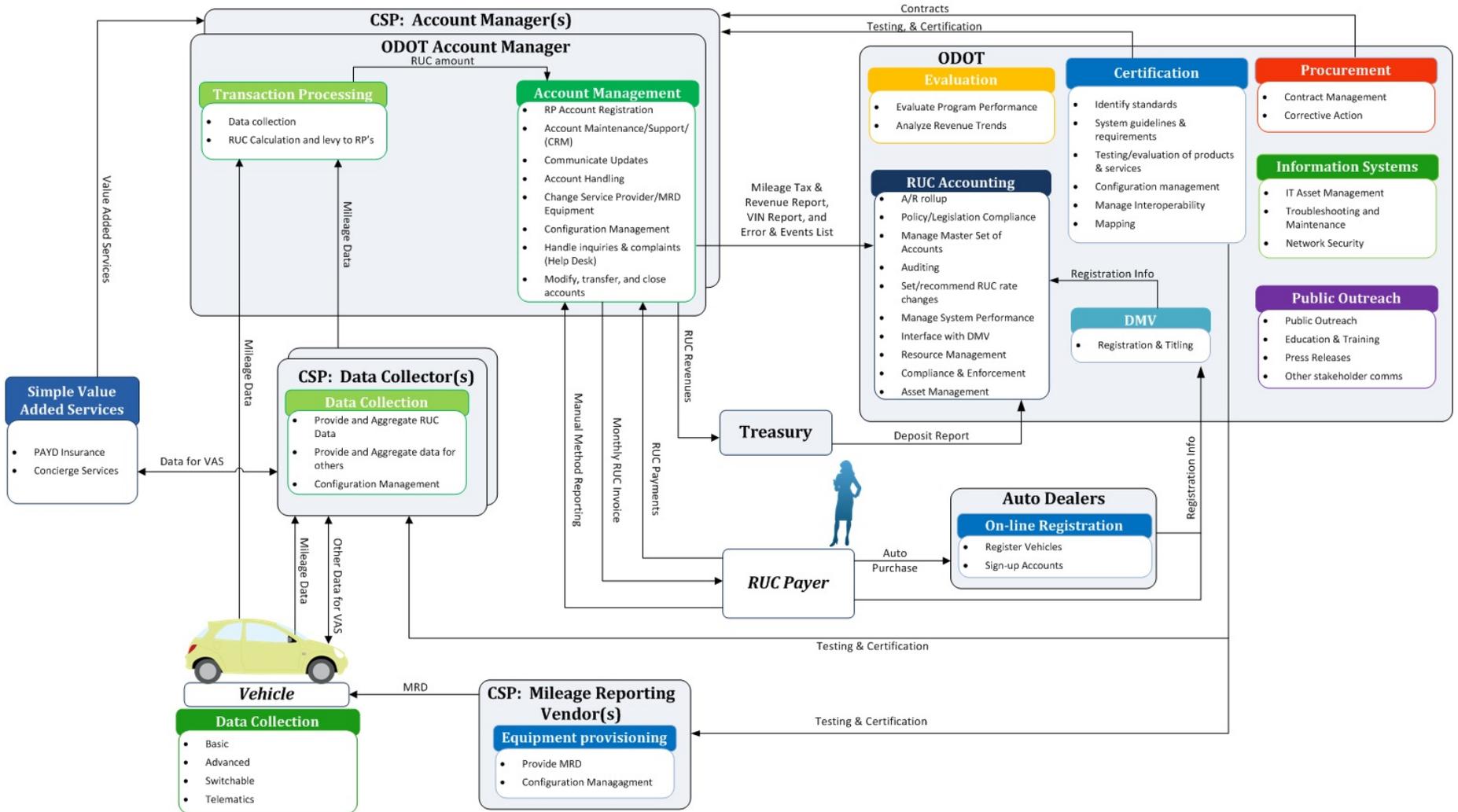
Road Usage Charge Accounting (RUCA) activities occur throughout this process. RUCA is an ODOT function that merges pertinent data on all road usage charges and performs accounting for the program, including checking to ensure that all mandated subject vehicles are indeed participating in the RUC program, and verifying that the vehicles enrolled in the program are paying correctly. The RUCA receives account information from the Road Charge Processing subsystems, maintains the master set of accounts, and ensures that the tax payments are ultimately provided to the state treasury. The RUCA also provides auditing and reconciliation functions for the RUC, supports enforcement activities, measures and evaluates RUC system performance, provides liaison activities with DMV, and works with RUTTF to recommend and set the per mile rate and other RUC fees.

Other activities and processes will be necessary to support the RUC functions including:

- Certification of private service providers and management of the associated procurement processes and agreements with ODOT;
- Compliance and enforcement of the RUC, including MRD technology that can identify when the MRD has been removed or otherwise has malfunctioned or has been disconnected, regular audits, and public outreach;
- Evaluation and system updates.

The RUC system will evolve over time. How it will look and operate at any time in the future will depend on a variety of factors, including (but not limited to) the number of subject vehicles in the system, the growth of other vehicle-related services (e.g., PAYD insurance, traveler information, concierge services) the growth of in-vehicle telematics, enhancements to vehicle and communications technologies and the associated standards, and the extent to which other states implement RUC systems and their compatibility with the Oregon RUC. Figure ES-3 shows the target configuration and RUC activities for the start of "Day 1" operations.

Figure ES-3
Target System Configuration for Day 1
Target System Configuration



1 Scope of Document

This document presents the pre-legislative version of the Concept of Operations (CONOPS) for the proposed Road Usage Charge (RUC) system to be deployed throughout the state of Oregon. It describes a system for charging mileage-based fees on the following groups of vehicles:

- Highly fuel-efficient vehicles that pay little or no fuel tax.
- Other vehicles for which the owners / lessees wish to pay the per-mile RUC and have applied to the Oregon Department of Transportation to do so.

The RUC system has also been configured to accommodate additional types of vehicles and functionality in the future.

This pre-legislative RUC CONOPS represent the third version of a Concept of Operations for the Oregon Road Usage Charge System. The first CONOPS, entitled “*Preliminary Concept of Operations; Oregon Vehicle Mileage Tax System*”² and dated November 30, 2011, provided a high –level overview of the proposed system noting that many technical and policy issues still remained to be resolved before the RUC system could be deployed (thus, the use of the term “preliminary” in the title of this document). This initial version also recommended that a RUC pilot be conducted to aid in analyzing and resolving several of these issues.

Legislation passed by the Oregon State Legislature in 2011 authorized such a RUC pilot, leading to the development of the Oregon Road Usage Charge Pilot Program (RUCPP). In preparation for the initial pilot of the RUCPP (for which more detail is provided in Chapter 3 herein), the November 2011 RUC CONOPS was updated and annotated with “RUCPP Note” boxes to provide clarification and additional information relevant to the proposed RUCPP, thereby creating a second version of the RUC CONOPS.

This third and current version of the RUC CONOPS reflects the lessons learned from the initial RUCPP pilot and current policy as reflected in legislation before the Oregon legislature for initial implementation of the RUC system (thus the name “pre-legislative” in the title). While many of the technical and policy issues have been resolved since the development of the first CONOPS, a few issues still remain as discussed in subsequent chapters herein.

1.1 Document Overview

By definition, the CONOPS provides a user-oriented view of the proposed RUC system. It does not delve into specific technologies or technical details. Rather, it focuses on:

- System needs and related policy directives
- Road usage charging objectives
- Proposed operational approaches and strategies for attaining RUC objectives

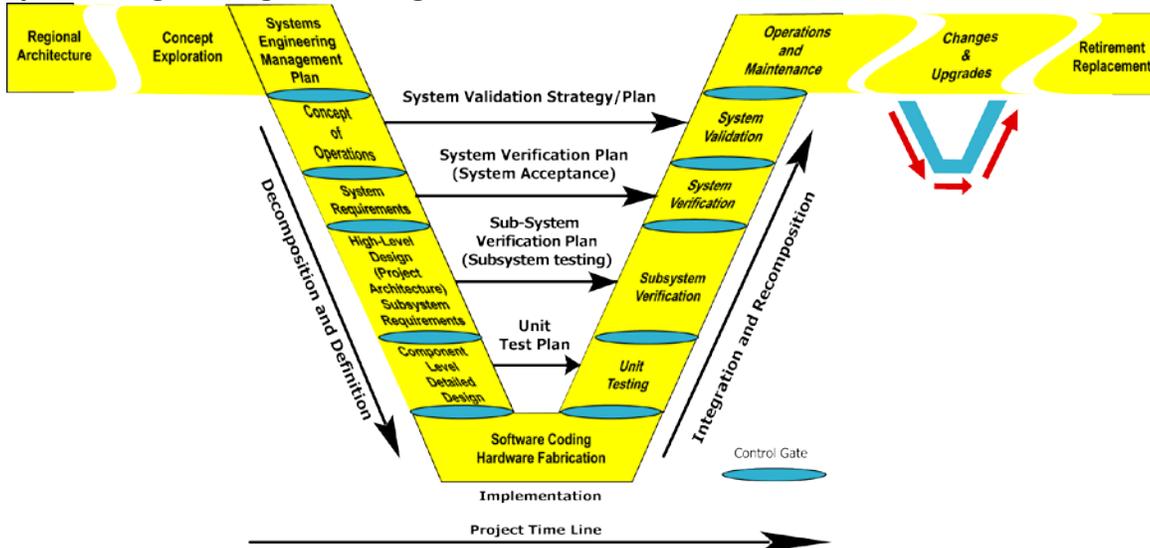
Moreover, an effort has been made to write this document “such that people with a wide range of technical backgrounds may easily understand it.”³

² In 2011, the name of the program was Mileage Tax System. It has subsequently been changed to Road Usage Charge

³ FHWA, “Developing and Using a Concept of Operations in Transportation Management System.”

Development of a CONOPS is one of the first and most important elements of the systems engineering process. Often depicted as a “Vee” diagram (Figure 1) to illustrate the relationship among the different stages of the system life cycle, systems engineering is a formal process by which quality is continuously promoted. Systems engineering may be described as a “requirements-driven development process,” that is, the user (i.e., stakeholder) requirements are the overriding determinant of the system concept, design, and component selection as well as implementation. The CONOPS lays the foundation for early agreement among the stakeholders on all aspects of the system and establishes the basis for developing detailed system requirements. Establishing the framework upfront avoids expensive, complex changes later in the project.

Figure 1
Systems Engineering “Vee” Diagram



Source: U.S. Department of Transportation System Engineering Guidebook

As previously noted, this is not the first CONOPS for the RUC system. The first version (November 2011) was used to develop the preliminary RUC system requirements; while the second version (RUCPP) was used as the basis for developing acceptance test procedures and validation plans for the initial pilot. It is anticipated that this third version will be used in much the same way as design and implementation of the RUC system moves forward, with subsequent updates being incorporated as technical issues are further resolved and as policy directives and operational rules are directed or updated.

The American National Standards Institute (ANSI) *Guide for the Preparation of Operational Concept Documents* was used as the basis for developing this and the previous versions of the RUC system CONOPS. According to that guide:

[the] purposes of an Operational Concept Document (OCD) are to:

- *Describe the system characteristics from an operational perspective*
- *Facilitate understanding of the overall system goals with users, buyer, implementers, architects, testers, and managers*
- *Form an overall basis for long range operations planning and provide guidance for development of subsequent system definition documents such as system specification and interface specifications*

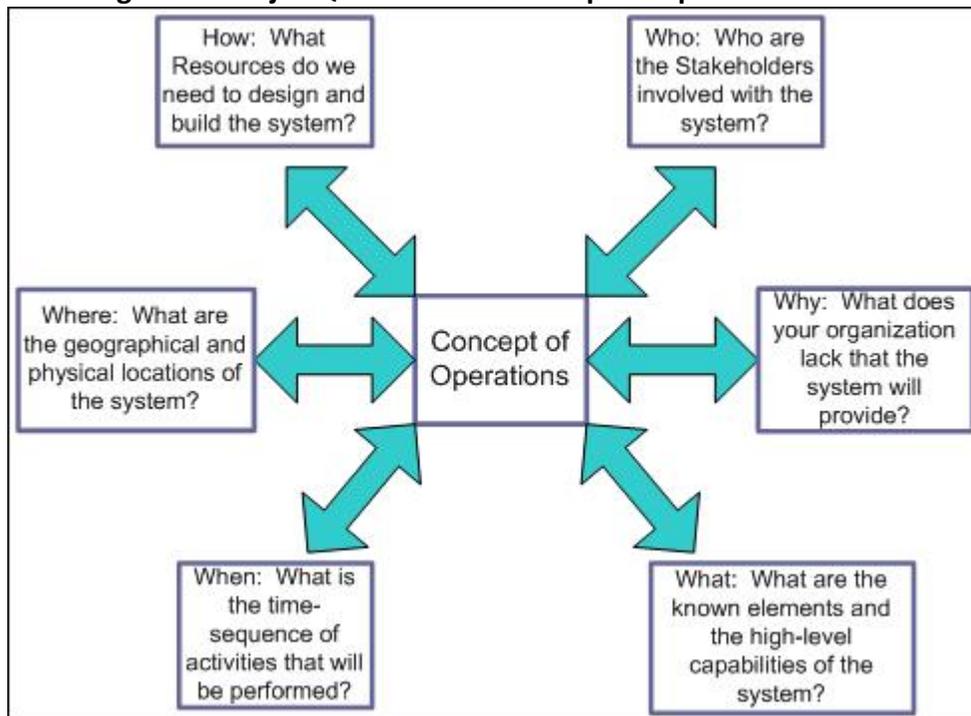
- Describe the users organization and mission from an integrated user/system point of view

The OCD must be somewhat all things to all people because the intended audience has a wide range of technical and managerial backgrounds. A good OCD should tell a story; that is, it should be a narrative, pictorial description of the system's intended use. This is accomplished by describing the What, Where, When, Who, Why, and How of the system operations."

These questions are graphically shown in Figure 2. Answers are provided throughout the rest of this document, with additional and supporting information provided in other supporting documents.

Figure 2

Flow Diagram of Major Questions the Concept of Operations Will Answer



Source: "Developing and Using a Concept of Operations in Transportation Management Systems", FHWA-HOP-07-001, August 2005

As was the case with the previous versions of the RUC CONOPS, this pre-legislative version should be viewed as a "living document" that will be updated as the proposed legislation is amended, as RUC policy directives are updated (including operational rules as defined by the Road User Fee Task Force [RUFTF]), as the implementation approaches are defined, and as any technical issues are further resolved.

1.2 Document Format

The format of this document is derived from multiple CONOPS standard outlines, including the ANSI/AIAA-G-042 Standard Outline and the Federal Highway Administration (FHWA) *Systems Engineering Guidebook for ITS*. It is organized into these sections:

- 1.0 Scope of Document** – Includes introductory material and definitions. An executive summary is provided at the front of the document.
- 2.0 References** – Lists the supporting documents used to prepare the CONOPS and other resources that may be useful in understanding the operations of the RUC system as currently envisioned.

- 3.0 Background** – Provides a brief discussion of the highway funding process in Oregon and the need for a mileage-based road usage charge on highly-efficient vehicles; the creation and subsequent activities of the RUFTF; the results and lessons learned from the initial pilot test in 2006 and the RUCPP pilot in 2012; and the current proposed legislation authorizing the implementation of a RUC system in Oregon.
- 4.0 System Needs and Operational Considerations** – Summarizes the system needs and associated policy directives as identified in draft legislation, by the RUFTF, and during stakeholder workshops internal to ODOT. These form the basis for the RUC system vision, objectives, concepts, and operational parameters.
- 5.0 User-oriented Operational Description** – Identifies the RUC system functions, processes, and the interactions among these functions, stakeholders/users, and summary descriptions of the proposed approaches for measuring and reporting the number of vehicle miles traveled on the highway system. How RUC operations may change over time is also addressed.
- 6.0 Operational and Support Environment** – Describes the operational and support environment of the RUC system, including the system architecture concepts, likely technologies for measuring and reporting the mileage, invoicing and related account management functions, accounting procedures, the role of the private sector in providing these functions (including certification), and system compliance.
- 7.0 Operational Scenarios** – Defines representative scenarios for the RUC concept and describes how the system will be used and operated. Each scenario is briefly described, including assumptions, stakeholders and their interactions and information flows, how the scenario may change over time, and potential issues that still need to be addressed.

1.3 Definitions and Abbreviations

Definitions are important. They provide the basis for a common understanding and help facilitate communication among RUC system stakeholders. Definitions, as used in versions of the supporting legislation, various presentations to the RUFTF, and related documents (including other documents developed as part of the RUCPP pilot), include:

- **Account Management:** A variety of activities, including setting up accounts for RUC payers and their respective vehicles, issuing RUC invoices and statements, receiving payments, managing accounts receivables, transmitting collected monies to the state treasury, and supporting audit activities.
- **Certification:** Provision by an independent body of written assurance (a certificate) that a product, service, or system meets specific requirements.
- **Certification Entity (CE):** An independent body that tests and evaluates RUC products and services, and provides written assurance (a certificate) that the product and / or service in question meets specific requirements and can be used in the RUC system.
- **Certified Service Provider (CSP):** A private (nongovernmental) entity that has entered into an agreement with ODOT for reporting metered use by a subject vehicle or for administrative services related to the collection of per-mile road usage charges and authorized employees of the entity. Several different types of CSPs are envisioned for the RUC, providing hardware and RUC services such as (refer to definitions herein):
 - Mileage Reporting Vendor (providing mileage reporting devices to RUC payers)

- Telematics Provider
- Data Collector
- Account Manager
- Communications Provider
- **Data Collector:** An entity and / or process that receives mileage information (and other RUC-related data) from one or more types of vehicle telematics and mileage reporting devices, including those supplied by different vendors. The data collector can collect data in multiple proprietary formats, aggregate the data, and send the information to one or more transaction processing and account management CSPs using the standard RUC message format.
- **Driver and Motor Vehicle Services Division (DMV):** Part of ODOT, DMV’s mission is to “promote driver safety, protect financial and ownership interests in vehicles, provide driver licenses and identification cards for Oregon residents, and to collect revenue for Oregon’s roads.”
- **Global Positioning System (GPS):** GPS receivers provide a vehicle’s location by triangulation from signals received from the NAVSTAR GPS satellite system.
- **Intelligent Transportation Systems (ITS):** The application of advanced electronics, computers, communications, and sensor technologies, in an integrated manner, to increase the efficiency and safety of the surface transportation network.
- **Mileage Reporting Device (MRD):** A device and/or software (i.e., telematics) in the vehicle capable of measuring vehicle mileage traveled and collecting other related data from the vehicle, processing and storing the information, and communicating with other devices and RUC subsystems wirelessly. There are different types of MRD approaches:
 - **Basic:** No location capability or technology is involved. All mileage is **undifferentiated** as to location. All mileage is assumed to be subject to the Oregon RUC.
 - **Advanced:** Location capability / technology is included and is used to **differentiate** mileage by in-state vs. out-of-state (with out-of-state mileage not subject to the Oregon RUC). Mileage may also be differentiated with respect to travel on private property.
 - **Switchable:** The user can “switch” between undifferentiated and differentiated operation depending on their needs and location.
- **Odometer:** Any technology for measuring the distance traveled by a vehicle, including—but not limited to—the vehicle odometer (i.e., the mileage displayed to the driver on the dashboard, as calculated by the vehicle’s electronics).
- **On-board Diagnostics II (OBD-II):** A vehicle’s self-diagnostic and reporting capability.
- **Open System/Open Architecture:** An integrated system based on common standards with interfaces and component specifications fully accessible to the marketplace, allowing different members of private industry to participate in the parts of the program that they are best-suited to support. This allows components performing the same function to be readily substituted or provided by multiple providers.
- **Oregon Department of Transportation (ODOT):** Responsible for operation and maintenance of the major (i.e., high volume) roads, bridges, tunnels, and related facilities in the state of Oregon.
- **Personally Identifiable Information (PII):** Any information that identifies or describes a person, including, but not limited to, the person’s travel pattern data, per-mile road usage charge

account number, address, telephone number, electronic mail address, driver license or identification card number, registration plate number, photograph, recorded images, bank account information, and credit card number.

- **Road User Fee Task Force (RUFTF):** Established by the Oregon legislature with the mandate “to develop a design for revenue collection for Oregon’s roads and highways that will replace the current system for revenue collection.”
- **Road Usage Charge (RUC):** A per-mile charge for metered use by a subject vehicle of the highways in Oregon.
- **Road Usage Charge Accounting (RUCA):** Several activities and processes for assuring ODOT that all subject vehicles are in the RUC system (coordinating with DMV), that all RUC revenues are being collected and forwarded to the state treasury, and that account management CSPs are complying with the system requirements. The RUCA activity also provides auditing and reconciliation functions, as well as supporting enforcement activities.
- **RUC payer:** Individuals who are subject to and responsible for paying the road usage charge, including:
 - **Owner:** A person who is the registered owner of a motor vehicle that is registered in Oregon and that is subject to the RUC. This does not include vehicle dealers.
 - **Lessee:** A person who leases a motor vehicle that is registered in Oregon and that is subject to the RUC. The RUC is applied to the lessee only during the term of the vehicle lease.
- **Road Usage Charge Pilot Program (RUCPP):** One or more pilots to demonstrate to the Oregon Road User Fee Task Force (RUFTF), legislators, and other stakeholders that the proposed RUC concepts and features are viable and valid, and that the vendor community has the ability to provide and implement the system components required to operate an effective, efficient and open RUC system.
- **Subject Vehicle** - A motor vehicle that is subject to the RUC. Per current draft legislation, this includes the following vehicles:
 - **Mandatory** – Model year vehicles of 2015 or later with a rating of 55 miles per gallon of gasoline or above, or 55 miles per gallon of gasoline equivalent or above.
 - **Voluntary** – A motor vehicle that has a rating of less than 55 miles per gallon of gasoline or less than 55 miles per gallon of gasoline equivalent, and for which the owners / lessees wish to pay the per-mile RUC and have applied to the Oregon Department of Transportation to do so.

The term “subject vehicle” does not include motor vehicles designed to travel with fewer than four wheels in contact with the ground (e.g., motorcycles), nor does it include motor vehicles subject to the Oregon weight-mile tax.

- **Telematics:** An evolving term that in the context of the RUC that refers to all types of communications – including data transmissions, voice and video – that originate or end inside (and internal to) vehicles.
- **Transaction:** A unique record of mileage activity for a specific time period and the associated mileage charges, possibly coupled with fuel tax credit information.

- **Transaction Processing:** An activity involving the collection of mileage and other data from subject vehicles, and the calculation and application of the appropriate RUC amount (including any credits) to each vehicle.
- **Value Added Services (VAS):** ancillary offerings around an industry's core business and services, often made available to customers at little additional cost. These VAS complement and "add value" to the standard service offering.
- **Vehicle Identification Number (VIN):** A unique serial number used by the automotive industry to identify individual motor vehicles.
- **VIN Summary Report:** a monthly report by ODOT or a CSP that includes a summary of all vehicle identification numbers of subject vehicles and associated total metered use during the month. The report may not include location information.

1.4 Assumptions

The information contained in this pre-legislative CONOPS is based on several documents as listed in Section 2. Some of these documents are subject to change as the program moves forward. These changes may be the result of proposed legislation and amendments thereto, policy decisions made by the RUTTF, ongoing discussions with private industry (i.e., the marketplace) regarding the capabilities of existing and future technologies and applications, or some combination of these. As previously noted, this is considered a "living document", and the CONOPS will be updated –including subsequent versions – as the policy and technology environment changes.

Another assumption behind the operational concepts and approaches described herein is that they are economically viable – that the life-cycle costs of implementing, operating, and managing the RUC system will be significantly less than the associated revenues collected by the system. A concurrent effort is to work with ODOT to estimate the revenues and costs of various alternatives and scenarios identified in the draft versions of the CONOPS, and to validate which of the alternative concepts make the most economic sense for all involved entities. The results of this parallel economic viability analysis have informed revisions and refinements to the CONOPS. The emphasis of the economic analysis is on life-cycle costs. It is not unusual for any new system with just a few users on "day one" to cost more than the available revenues at the outset. However, as the system matures, technology advances, and the number of users increases, significant economies of scale can occur, reducing per transaction costs and increasing revenues. This is the vision and goal for the RUC.

2 Referenced Documents

The following documents were used to prepare this document, and may prove useful in understanding the operations of the RUC system:

Current and Previous Legislation and Policies

- HB2453B 2013 (proposed legislation for implementing the RUC)
- HB 2138B, 2011 (as passed)
- Minutes/presentations from the RUFTF (<http://www.oregon.gov/ODOT/HWY/RUFPP/ruftf.shtml>)

Previous RUC Reports and Related Information

- “Preliminary Concept of Operations for the Oregon Mileage Tax System” (Nov 2011)
- “Operational Concept Document for the Oregon Road Usage Charge Pilot Project” (Feb 2012)
- RUC workshops conducted in May and June 2011, including a 1-day CONOPS workshop with stakeholders on June 9, 2011
- “Oregon’s Mileage Fee Concept and Road User Fee Pilot Program - Final Report” (2007)
- RUCPP Procurement Documents (2012)
- RUCPP Evaluation Reports (2013)
- ODOT Request for Qualification (RFQ) from multiple contractors to provide the routing of telematics data (e.g., data aggregation) services of in-vehicle telematics data as provided by existing onboard OEM installed telematics systems
- Oregon Mileage Tax System Strategic Program Plan (Nov 2011)
- “Tolling and Pricing Operational Concept” Draft (2011)

Other Reports on Mileage-Based User Fees

- “Mileage-Based User Fees For Transportation Funding – A Primer for State and Local Decision Makers”; The Rand Corporation; 2012
- GAO; “Highway Trust Fund - Pilot Program Could Help Determine the Viability of Mileage Fees for Certain Vehicles;” December 2012
- “Discerning the Pathway to Implementation of a National Mileage-Based Charging System” (2009), Commissioned by Transportation Research Board
- “Mileage-based User Fee Technology Study” (2009), prepared by Noblis for the Research and Innovative Technology Administration (RITA) and FHWA, Contract #: DTFH61-05-D-00002
- “Paying Our Way – A New Framework for Transportation Finance” (February 2009), report of the National Surface Transportation Infrastructure Financing Commission

Other Documents

- *Systems Engineering Guidebook for ITS – Version 3.0*, FHWA (<http://www.fhwa.dot.gov/cadiv/segb/>)
- Guide to the Preparation of Operational Concept Documents (1992), ANSI/AIAA-G-043-1992

-
- “Developing and Using a Concept of Operations in Transportation Management Systems,” FHWA-HOP-07-001, August 2005
 - Oregon ITS Strategic Plan (1997-2017)

Several parallel activities have also been underway during the development of the pre-legislative RUC CONOPS, including: being developed (consisting of several drafts). These include:

- Risk Management Strategy and Matrices
- Tech Memo describing methodology for performing the economic analyses
- Implementation Plan and Contracting Strategy
- Updated System Requirements Specification and Interface Control Document

The development of these documents and the CONOPS were coordinated to ensure consistency of the information contained therein.

3 Background

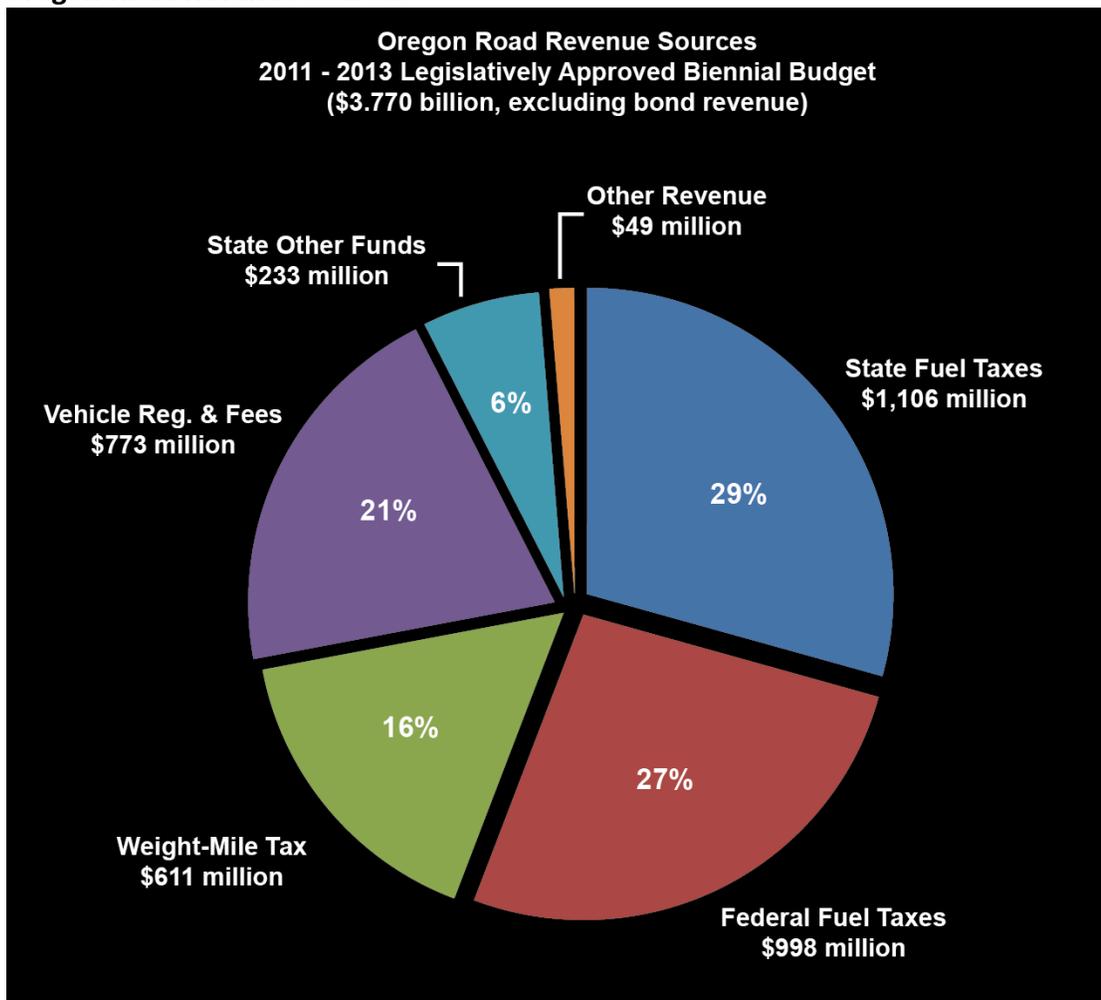
3.1 Highway Funding in Oregon

Oregon's multimodal transportation system includes 19,128 lane miles of state highways, 26,737 miles of county roads, and 10,799 miles of city streets. Most of the revenue required to preserve, maintain, operate, and modernize the state's highway system comes from the following sources (Figure 3):

- Fuel taxes on vehicles (a user fee based on fuel consumed and paid for at the pump⁴. The Federal fuel tax is 18.4 cents per gallon for gasoline and 24.4 cents per gallon for diesel, and has been at these rates since 1993. The Oregon fuel tax is 30 cents per gallon for both gas and diesel)
- Registration, including license and title fees, and
- A weight-distance tax for trucks weighing more than 26,000 pounds

Figure 3

Oregon Road Revenue Sources



⁴ Oregon is a road finance pioneer. It was the first state, in 1919, to enact a gas tax during the nation's early phase of auto-related road building.

The weight-distance tax system for heavy trucks is operated by the ODOT Motor Carrier Transportation Division (MCTD). The current system relies on manual reporting, with most motor carriers reporting weight-distance tax on a monthly basis. Motor carriers that meet certain conditions may report taxes on a quarterly or annual basis. MCTD is currently testing a pilot application for a potential electronic reporting system. Moreover, MCTD envisions the use of third-party entities to help manage and administer the system in the future.

The current method of collecting fuel taxes at the pump has many advantages, including:

- Ease of payment for consumers: payment is included as part of fuel bills and allows for the use of cash or credit.
- Ease of collection: taxes are embedded in commercial transactions that are paid by the distributor, who is reimbursed by retailer, who is, in turn, reimbursed by the consumer.
- Low cost of administration: the state’s cost to audit fuel taxes amounts to just \$1 million annually.
- Minimal evasion potential: payment is made at the pump and is conditional upon payment for the fuel.
- Protects privacy: taxes are paid anonymously by consumers.
- Minimal burden on business: retail businesses bear only the burden of lost revenue from evaporation of gasoline after purchase from distributors and before the sale to customers.

While the advantages are many, there are two major drawbacks to paying fuel taxes at the pump:

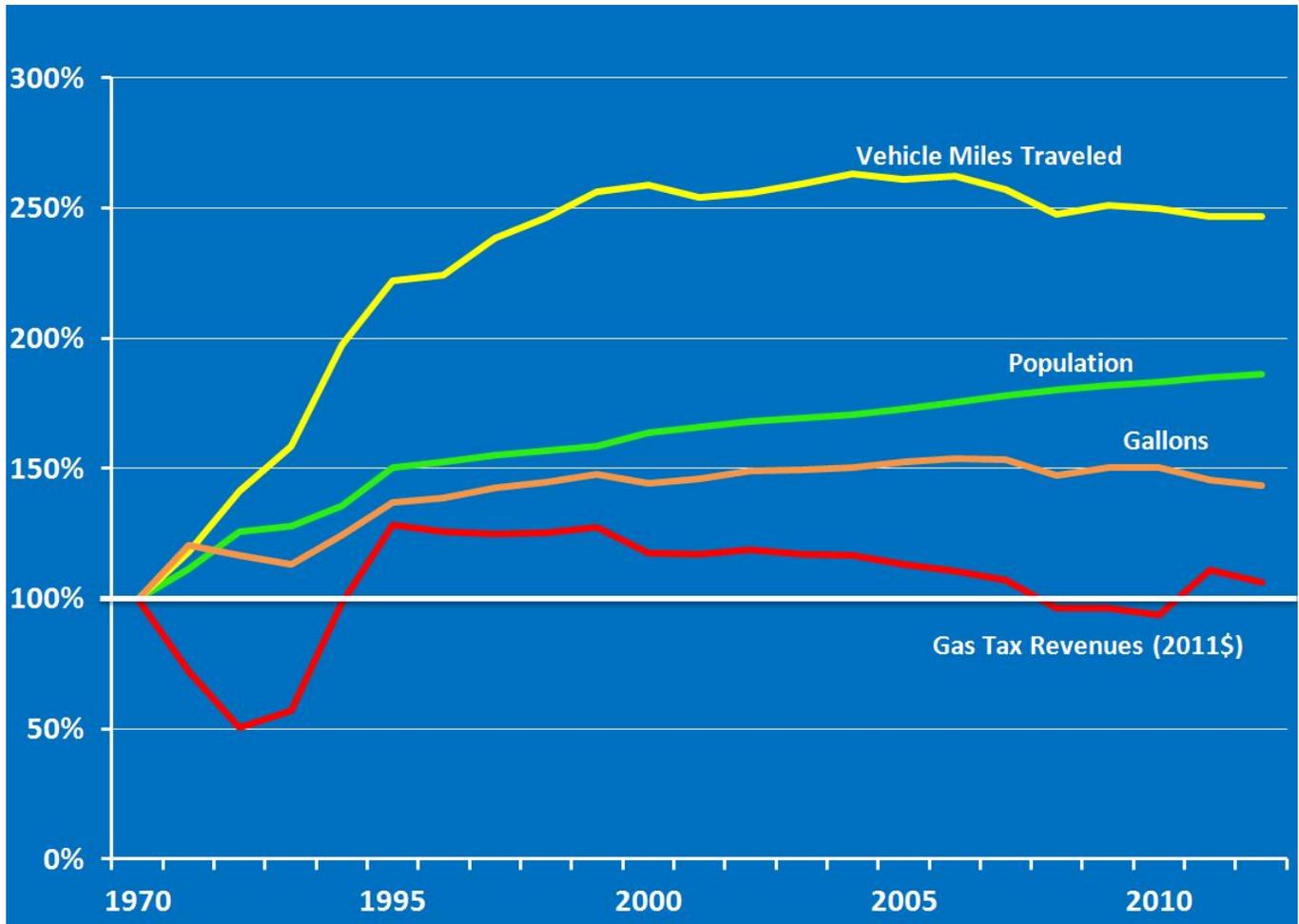
1. **The amount of taxes charged are only loosely connected to the burden the vehicle places on the state highway system.** There is no flexibility to support any form of road usage charging based on the actual number of miles driven, where the miles are driven, or the type of vehicle. A few decades ago, there was not that much difference within the vehicle fleet with respect to average MPG; a situation that allowed the fuel tax to function as a reasonable surrogate for the number of miles driven. With the increasing attention to vehicle fuel efficiency – including the recent introduction of electric vehicles (EVs), hybrid electric vehicles (HEV), and plug-in hybrid electric vehicles (PHEV) – the gap between the most and least fuel-efficient vehicles has widened greatly. This has led to an issue of overall fairness – that all users of the roadway should pay their fair share based on the use of the transportation network Making those who use the transportation network pay for that use (the “user pays” principle), and contribute to the improvement, maintenance and operation of the roadways (including reducing congestion which their driving helps to create).
2. **There has been a significant drop in fuel tax revenues** at the state (including Oregon) and federal levels over the past decade. As a result of more fuel efficient vehicles, the gas tax payments per vehicle mile traveled have dropped, with drivers of electric vehicles paying no fuel tax. Total fuel tax receipts have not kept up with the transportation funding needs, even though the population and number of vehicle miles traveled (VMT) has increased. This is shown in Figure 4 – a large increase in population and VMT since 1970 (not to mention an increased need for improvements to the transportation infrastructure); but the fuel tax revenues have remained relatively constant in current year dollars.⁵ This overall funding gap can only be expected to

⁵ The slight jump in 2011 reflects the 6 cents per gallon increase in the Oregon fuel tax that took effect in January 2011.

grow as the average fuel economy of the American vehicle fleet improves⁶ and as the emerging fleet of EVs and PHEVs become more ubiquitous along the roadways.

Figure 4

Percent Change in Vehicle Miles Traveled, Population, Gallons, and Fuel Tax Revenues Since 1970



A range of Oregon vehicle fleet forecast scenarios illustrates the implications of these current fuel consumption trends on fuel tax revenues. Figure 5 shows the average cents paid per vehicle mile driven for ten forecast scenarios within Oregon. Each scenario involves a distinct combination of forecasted sales and ownership of various vehicle types and fuel efficiency within Oregon. These forecasts were based on recent literature on the subject and utilized the ODOT Greenhouse Gas Statewide Transportation Emissions Planning Model (GreenSTEP). The scenario labels specify the assumptions made regarding three categories:

- “Tech” represents the vehicle sales of EV / PHEV technology-based vehicles. Four categories were developed from:
 - “Low” representing minimal market penetration of EVs / PHEVs due to costs, no major breakthrough in battery technology, and increased efficiency of internal combustion engines (ICE); to

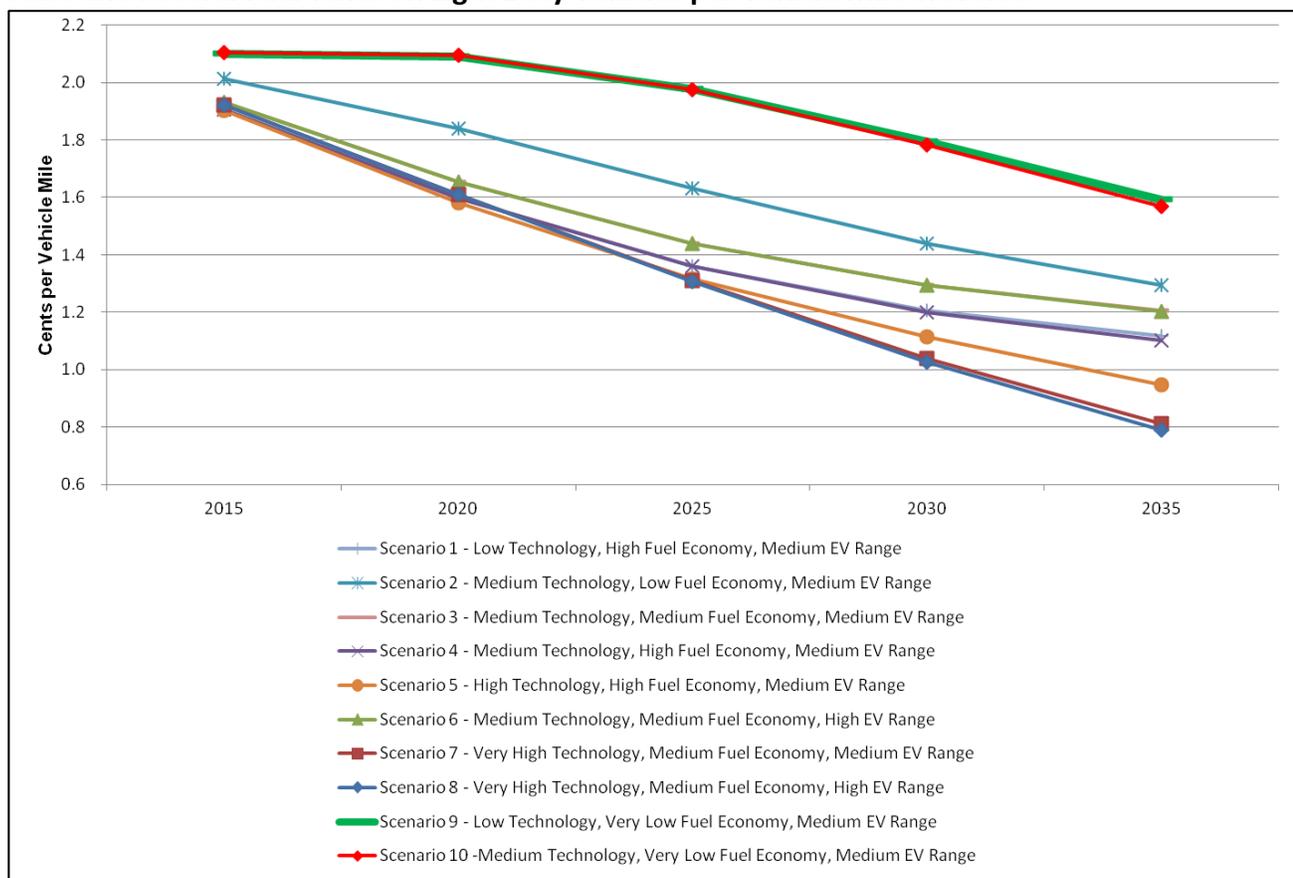
⁶ The Corporate Average Fuel Economy (CAFE) standards are an average 35.5 miles per gallon for vehicle fleets in 2016, and an average of 54.5 miles per gallon in 2025.

- “Very High” representing the other end of the EV / PHEV market penetration spectrum, in which EVs and PHEVs become the dominant vehicle type on the road.
- “MPG” represents the average MPG for ICE and Hybrid vehicles ranging from:
 - “Very Low” (i.e., average of 24.9 MPG in 2015, increasing to 40.5 by 2035); to
 - “High” (i.e., average MPG of 44.7 in 2015 and 46.9 in 2035). The “High” MPG scenario assumes a significant influx of engine start/stop and similar technologies in the next few years.
- “EV Range” represents the average number of miles per charge for EVs and PHEVs. This had minimal direct impact on fuel tax receipts.

The ten forecasts presented range from the more conservative to the more ambitious technology development and fleet deployment scenarios.

Figure 5

State and Federal Fuel Taxes on Light Duty Vehicles per Vehicle Mile Traveled



As can be seen from Figure 5, it really does not matter which future scenario occurs; fuel tax revenues will continue to decline in the years ahead, with the worst case scenario in this regard being the “Very High Tech” in which the majority of vehicles will be EVs and PHEVs with their drivers paying no (or minimal) fuel tax to support the operation and maintenance of the roadways they are using. This trend occurs even though VMT are flat or increasing in every year through 2035 in this forecast.

A majority of policymakers and industry analysts across the nation now agree that the fuel tax can no longer be relied upon to provide sustainable revenues improving, operating and maintaining the nation’s roadway infrastructure. A vast amount of research exists on the necessity to find alternative ways to

collect revenue from roadway users that is better aligned with actual roadway usage than the current fuel tax, and that can solve the financial challenges of funding a sustainable transportation infrastructure. Many of these studies conclude that user charges based directly on miles traveled are one of the leading options.⁷

This situation does present something of a conundrum for Oregon and other states. To reduce emissions and protect the environment while also reducing the nation's dependence on foreign oil, Oregon wants to support expanded use of electric vehicles and other highly fuel efficient vehicles. At the same time, however, the state's constitutional requirement for "cost responsibility" means that the owners of these vehicles should pay a proportionate share of the costs incurred to maintain the highway system. Making those who use the transportation network to pay for that use – the "user pays" principle – appeals to a fundamental notion of fairness widely accepted by consumers in other marketplaces.

3.2 Road User Fee Task Force (RUFTF)

The RUFTF was established by the Oregon legislature in 2001 with the mandate to "develop a design for revenue collection for Oregon's roads and highways that will replace the current system for revenue collection." In 2003, after considering 28 different funding ideas, the RUFTF recommended a road revenue program that included a studded tire tax, tolling new highway capacity, congestion pricing, and a mileage-based user fee. This led to the Road User Fee Pilot Program, discussed below. The RUFTF also recommended that ODOT conduct a pilot program to study the feasibility of replacing the gas tax with a mileage-based fee, based on miles driven in Oregon and collected at fueling stations. ODOT launched an initial 12-month pilot program in April 2006 to test the technological and administrative feasibility of the Oregon Mileage Fee Concept. The program included 299 volunteer motorists (and 285 vehicles) and two service stations in Portland.

3.2.1 Initial Oregon Mileage Fee Concept Pilot

The initial Oregon Mileage Fee Concept (Figure 6) used a pay-at-the-pump model wherein both mileage data and mileage charge collection occurred at the fuel pump.⁸ Oregon's pay-at-the-pump model involved the use of an on-vehicle receiver that accessed signals from the GPS to delineate predefined zones. This feature enabled the receiver to determine the location of a vehicle while in motion. In addition to the GPS system, the pilot program also tested the feasibility of measuring mileage by using the odometer to measure distance traveled.

During refueling, a wireless electronic reader at the fuel pump recorded the stored mileage data allocated to each zone via short-range radio frequency. The system then automatically uploaded these data through the fueling station's point-of-sale system via a digital subscriber line (DSL) to a revenue collection agency (ODOT) central computer in order to access the mileage charge rates. Once the rates were applied, the central computer sent the billing figures back to the fueling station via the DSL line. The fueling station then billed the motorist for the mileage charges while also deducting the gas tax (along with payment for the fuel purchased) (

⁷ For example, in 2009, the National Surface Transportation Infrastructure Financing Commission concluded that "in the long term (over 20 years), fuel taxes will be unsustainable and mileage-based user fees are among the most preferred alternatives. A vehicle-miles-traveled (VMT)-based charge system is the best option for raising the revenues the nation needs and supporting the national policy goals to which we aspire." A 2012 Rand Report ("Mileage-Based User Fees For transportation Funding – A Primer for State and Local Decision Makers") concludes that a "system of mileage fees—while challenging to design and implement and more costly to administer—would offer a significantly more stable source of funding in future decades and could support additional policy goals as well."

⁸ More information is available in "Oregon's Mileage Fee Concept and Road User Fee Pilot Program: Final Report;" James M. Whitty, November 2007. http://www.oregon.gov/ODOT/HWY/RUFPP/rufft_reports.shtml

Figure 7). Motorists paid only for mileage driven within a jurisdictional boundary. Motorists without the on-vehicle device paid the fuel tax.

Figure 6
Oregon Mileage Fee Concept Pilot Configuration

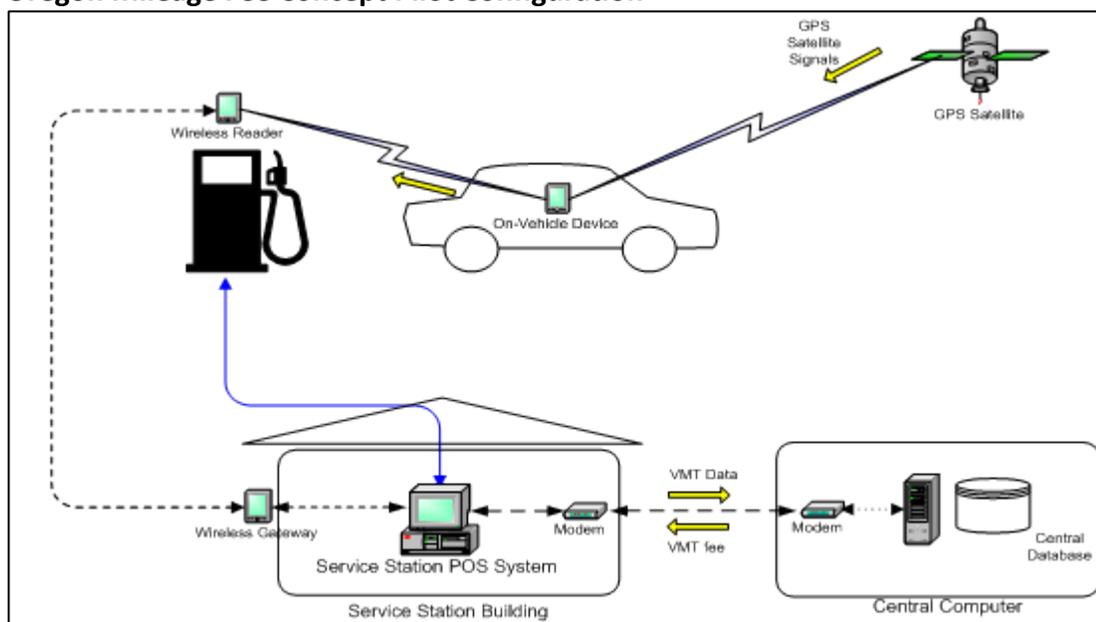


Figure 7
Oregon Mileage Fee Concept Pilot Sample Receipt

The Receipt		
CSR R# 1 S# 1 T# 882316 10:55 AM 06/09/06		
Leathers Fuels 11421 SE Powell Blvd Portland, OR 97266		
Pump# 1 Unleaded		
19.50 @ 2.549	49.71	
ST Fuel Tax @ .24	(4.68)	
VMT Fee :	5.12	
Rush Hour :	40	
In-Oregon :	28.6	
Non-Oregon :	0	
No Signal :	0	
Subtotal	50.15	
Total	50.15	
Cash	50.15	
Thank You !		

Fuel tax deducted from fuel purchase price

Mileage fee imposed as part of fuel purchase

The Oregon pilot program tested the electronic payment system for determining and paying the differential between mileage charges and gas taxes. Following a consumer transaction, the service station retailer remitted, via electronic payment, the differential between the total mileage charges paid by the motorist and the amount the service station retailer had reimbursed the distributor for the prepaid gas tax, if greater. If the retailer collected less in total mileage charges than the amount of

prepaid gas taxes reimbursed to the distributor, ODOT paid the difference to the service station retailer. An electronic accounting mechanism managed payments of the mileage charge differential through periodic reconciliation between ODOT and the retailer. The service station retailer's transactions with ODOT added little complexity, with minimal operating expense to retail operations.

One of the first pilot programs of its kind, the initial Oregon Mileage Fee Concept Pilot was universally hailed as a success. Not only did it demonstrate that electronic collection of fees based on road usage was viable, it successfully integrated many of the requirements for such a new highway revenue system, including embedding mileage charge payments into an existing payment system (i.e., for fuel purchases). This involved only a minimal increase in auditing costs, with minimal potential for tax evasion because access to fuel was conditional upon payment for the fuel. In addition, the payment process was familiar to motorists; the taxes were paid, in cash or by credit or debit card, as part of the fuel bill.

Even with these many positive attributes, national scrutiny of Oregon's 2007 Road User Fee Pilot Program revealed design flaws.

- The principal flaw was dependence upon **a closed system** for mileage data collection and payment. The pay-at-the-pump model only had one way to develop data, one way for data to flow, and only a government agency could manage the accounts. The technology experts noted that this applied technology would eventually become stuck in time.
- Another issue was public reaction to the concept and approach. One concern was **privacy** – that the use of geo-location technology would enable the government to track where motorists had driven.
- Another issue was the perception that the system would require a **large, costly bureaucracy** to implement and operate. Others objected to the idea that government could force motorists to install a device—any device—in their cars (even though the government already does just that with everything from seat belts to emission control devices).

3.3 A New Vision and Legislation

The RUFTF was reconstituted in 2010 with the stated purpose to “consider revenue options for the emerging fleet of electric and plug-in hybrid electric vehicles that will pay no fuel tax or only a tiny amount.” The task force met three times in 2010 to assess the viability of a per-mile charge collection system and to develop draft legislation that would impose a mileage charge system in Oregon, all the while keeping these lessons learned from the 2007 Road User Fee Pilot Program in mind:

- Provide choices to motorists
- Do not mandate a GPS box for motorists' cars
- Make the system simple and easy to use
- Design the data collection and payment system to access existing processes familiar and acceptable to the public
- Allow the private sector to provide data collection options and payment options

The Oregon legislature enacted legislation in 2011 (HB 2138) that directed the RUFTF to develop recommendations on the design of pilot programs to test alternative approaches for a road usage charge. The legislation directed the RUFTF to consider the following in this regard:

- Availability, adaptability, reliability, and security of methods that might be used in recording and reporting highway use;

- Protection of any personally identifiable information used in reporting highway use;
- Ease and cost of recording and reporting highway use;
- Ease and cost of administering the collection of taxes and fees as an alternative to the current system of taxing highway use through motor vehicle fuel taxes; and
- Effective methods of maintaining compliance.

3.3.1 Road Usage Charge Pilot Program (RUCPP)

The RUFTF authorized ODOT to develop and deploy a RUCPP demonstration system in advance of the 2013 biennium legislative session. The primary goal of the RUCPP was a “feasibility validation” – to demonstrate to the RUFTF, legislators, and other stakeholders that:

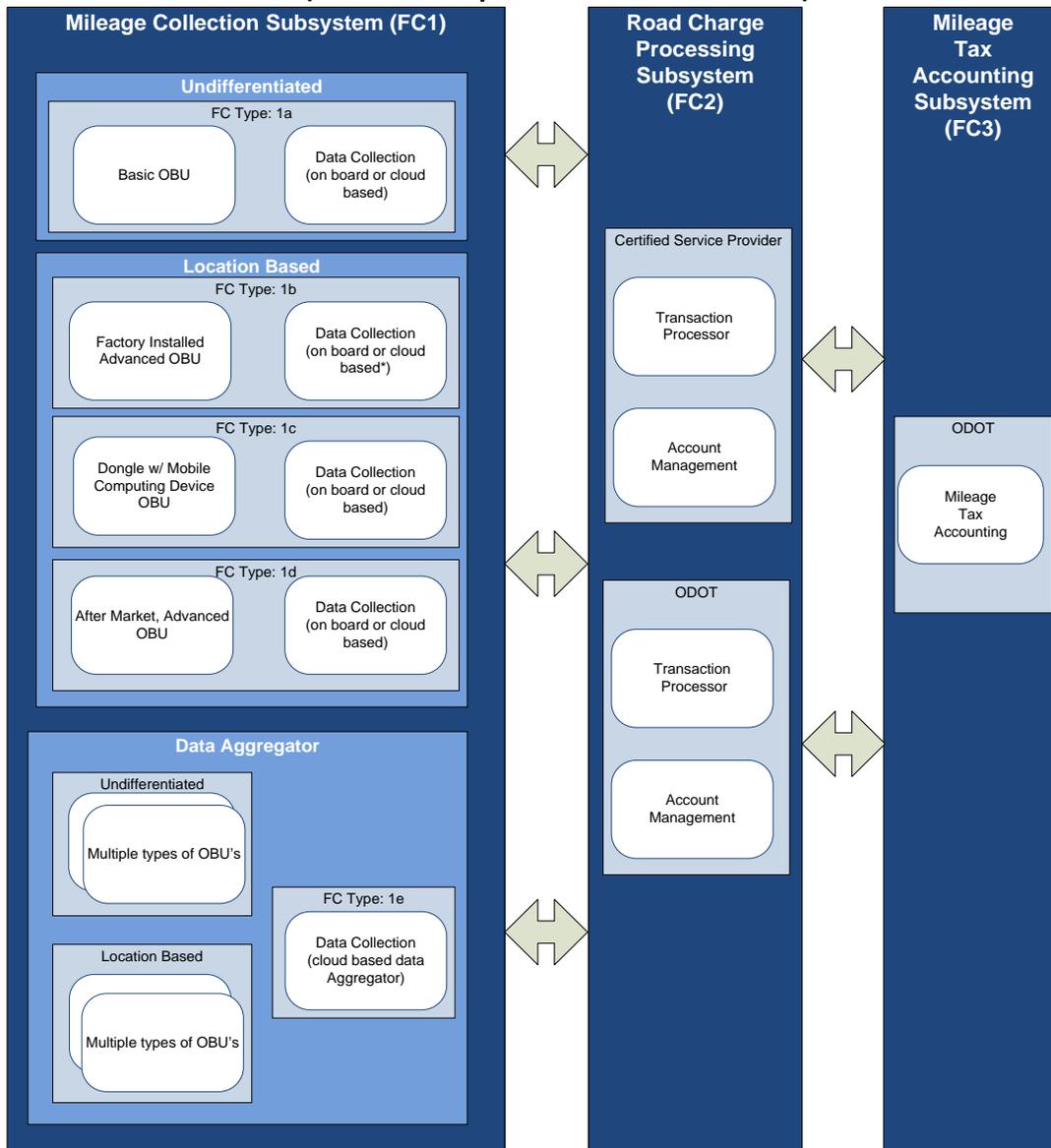
- The proposed RUC goals and objectives can be achieved,
- The system concepts and features are viable and valid, and
- The vendor community has the ability to provide and implement the system components required to operate an effective, efficient and open RUC.

To achieve these goals, the pilot was developed and designed to demonstrate and evaluate the rudiments of the new RUC system, including (shown in Figure 8 as “Functional Categories” [FC]) different types of mileage reporting devices and the associated data collection processes and wireless communications (the “Mileage Collection Subsystem”); transaction processing and account management functions (the “Road Charge Processing Subsystem”), and RUC accounting.

(Note – Figure 8 is an excellent example of how the concepts, and even the naming conventions, for a system that advances the state of the practice are continually evolving. For example, the “OBU” (i.e., on-board unit) shown in the Mileage Collection Subsystem is now called the mileage reporting device (MRD); the “Factory-Installed Advance OBU” is now called “telematics”; and the “Dongle with Mobile Computing Device” represents the “switchable” mileage reporting approach (in this case, using a Smartphone). Similarly, “Mileage Tax Accounting” is now called “RUC Accounting”.)

The RUCPP procurement process commenced in January 2012 with the development of the preliminary system requirement specification (PSRS) and the preliminary interface control document (PICD) defining the contents and formats of the messages between the Mileage Collection Subsystem and the Road Charge Processing (RCP) Subsystem, and between the Road Charge Processing Subsystem and the RUC Accounting Subsystem. The November 2011, the preliminary CONOPS was also updated and annotated to reflect the specific operational concepts included in the pilot.

Figure 8
RUCPP Pilot Schematic (from RUCPP procurement documents)



A Request for Information (RFI) was issued in February 2012, followed by a vendor workshop and interviews and discussions with those vendors who desired a conference with ODOT. Twenty-eight (28) responses to the RFI were received and reviewed. Based on the information obtained during the vendor workshop, the vendor interviews, and the RFI responses, a Request for Proposal (RFP) for prospective vendors to supply, install, and demonstrate one or more of the subsystems and components for the RUCPP was issued in March 2012.

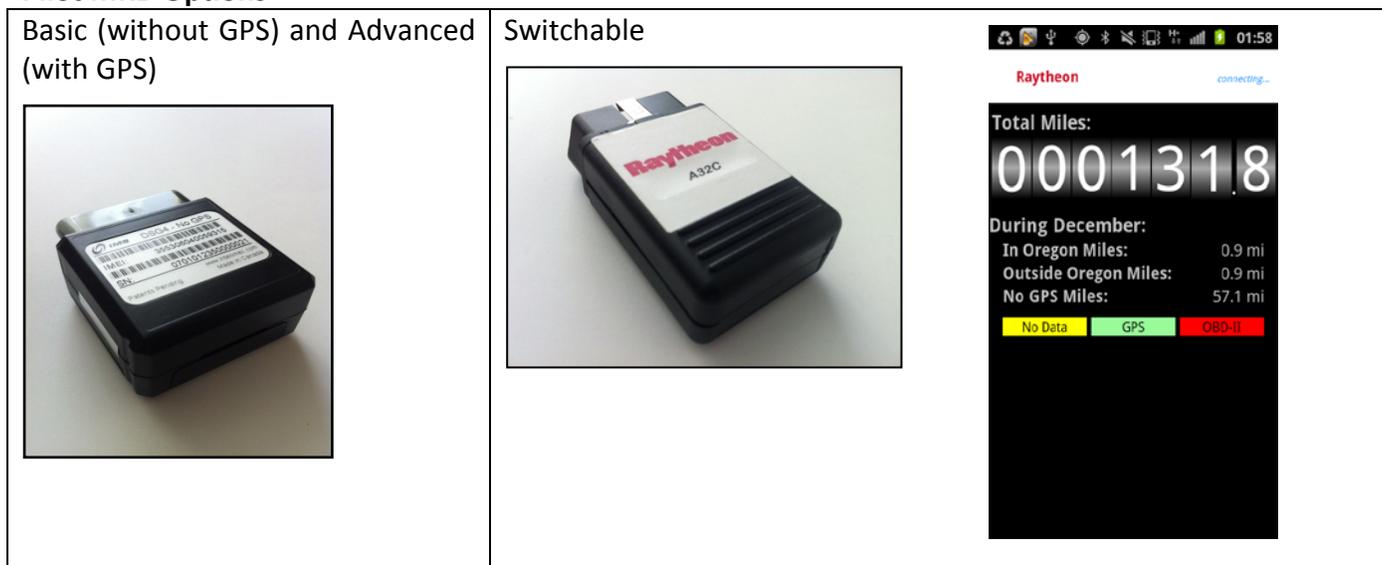
Proposals were received from nine teams consisting of nearly 20 vendors. The proposals were evaluated with five vendor teams identified as being in the competitive range. Three of the five competitive vendor teams were further down-selected for unit testing to demonstrate the functionality of their offered subsystems and components. This unit testing was conducted in June 2012 on an “as is” basis⁹ with the results evaluated as the second phase of the solicitation.

⁹It was not expected that the proposed components and subsystems would satisfy all of the system requirements or conform to the mileage messages identified in the preliminary Interface Control Document (PICD).

Based on the results of the unit testing and subsequent discussions with the three down-selected vendors, the system requirements specifications and interface control documents were updated. Work Order Contracts (WOCs) and Statements of Work (SOW) were issued to two vendors for providing the following subsystems and components as part of the RUCPP initial demonstration system:

- Mileage Collection Subsystem (Figure 9) with:
 - Basic MRD – provided by IMS as a subcontractor to Sanef
 - Advanced MRD – provided by IMS as a subcontractor to Sanef
 - Switchable MRD (Basic MRD with Bluetooth connectivity to an Android Smartphone with GPS capability) – provided by Raytheon.
- Road Charge Processing (RCP) Subsystem – provided by Sanef, receiving mileage and related vehicle data from all three types of MRDs via the standard mileage message, and providing transaction processing and account management services for participants who desired an Advanced or Switchable MRD, or who chose to pay by credit card.
- ODOT RCP for those participants who chose to pay by check, or who chose a “Flat Annual Tax” – a non-technology choice (i.e., no MRD) whereby the participant paid \$135 for the 3-month pilot. This was also provided by Sanef on behalf of ODOT.
- A limited Road Usage Charge Accounting (RUCA) Subsystem – provided by the Consultant Team, and providing a subset of the RUCA functions (i.e., a series of spreadsheets updated monthly).

Figure 9
Pilot MRD Options



Following in-depth integration and system acceptance testing, the RUCPP pilot commenced operation on November 1, 2012 and ran through the end of February 2013, with various MRD choices and vehicle types incorporated into the pilot at different times to accommodate additional development to correct issues identified during the testing and to accommodate additional states in the pilot.

In all, 88 vehicles were involved in the RUCPP (Table 1), with a pilot duration of three months for most participants. In addition to the multiple choices offered, another attribute that made the RUCPP pilot unique and the first of its kind is that the Oregon participants – which included members of the state legislature, Oregon State Transportation Commission, Governor’s office, and ODOT executives and staff

– was that these individuals actually paid the Road Usage Charge (at 1.56 cents per mile¹⁰), less credits provided for any Oregon gas taxes paid and/or miles driven on private property during the pilot. Invoices were sent out monthly (Figure 10), with the funds subsequently sent to the State Treasury.

Table 1
RUCPP Participant Summary

Choice (MRD Type and Account Management)	Oregon	Washington	Nevada
Basic MRD – Account Managed by Private Sector	8	5	16
Basic MRD – Account Managed by ODOT	7	N/A	N/A
Advanced MRD – Account Managed by Private Sector	24	16	7
Switchable MRD – Account Managed by Private Sector	4	N/A	N/A
Flat Annual RUC (prorated for 3 months) – Account Managed by ODOT	1	N/A	N/A
TOTAL	44	21	23

Figure 10
Sample RUCPP Invoice

From : Sanef S.A. 8130 SW Beaverton-Hillsdale Hwy Portland, Oregon 97225	On behalf of : Road Usage Charge Pilot Program 355 Capitol St. NE MS 32 Salem, Oregon 97301-3871	
To : Chuck Larsen 2262 37th place NW Salem, Oregon 97304	Invoice No: SI1210-19 Invoice Month: September 2012 Issue Date: Oct 25 2012	

**ROAD USAGE CHARGE PILOT PROGRAM
CUSTOMER INVOICE**

Item Description	Amount	Rate (\$)	Subtotal
Vehicle: Ford Mustang License Plate Number: 687 CGT PLAN: ADVANCED			
Mileage Tax			
Total Mileage	176.30 miles		
Oregon Taxable Miles	176.30 miles	\$0.0156	2.75
Fuel Tax Refund	7.65 gals	\$0.3000	-2.30
		Subtotal	0.45
TOTAL Mileage Tax Due			
	Total Mileage Tax Due		\$0.45
	Payment Due Date		Nov 25 12
	Your account balance		\$0.45

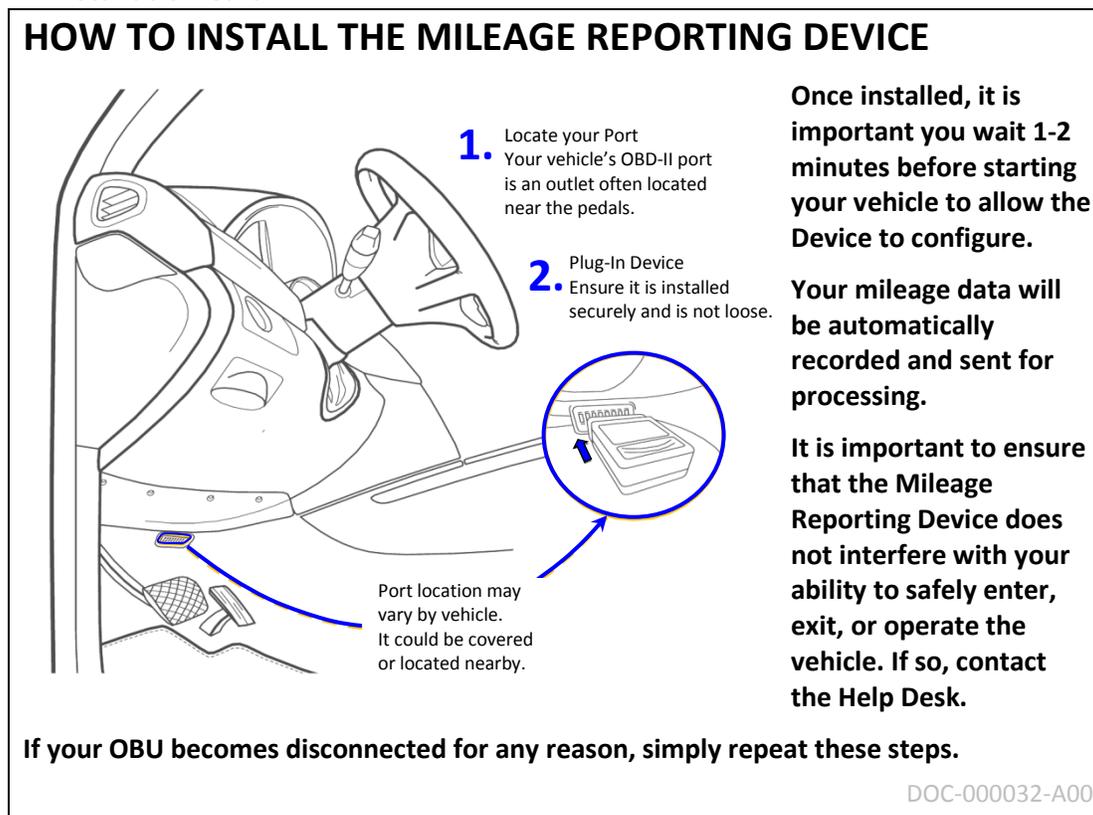
¹⁰ 1.56 cents per mile is equivalent to the Oregon tax rate for vehicles that average between 19 and 20 miles per gallon. Those pilot vehicles with an average fuel economy of 20 miles per gallon or greater paid a net RUC; while those participants with “gas guzzlers” received a net credit (i.e., payment) for the Pilot. As is discussed later, it is envisioned that vehicles which get less than 20 mpg will not be included in the actual RUC.

Other services provided during the RUCPP pilot included:

- **On-boarding Support** (by ODOT with support from the Consultant Team) – RUCPP participants were asked to sign a participant agreement, which requested such information as their name, address, phone number, and email; and information regarding their vehicle (e.g., make, model, year, vehicle identification number [VIN], license plate number, and fuel type). This information was then entered into the RUCPP inventory management system to notify the account management vendor which participants were “approved” for the pilot. This information was also used by the MRD vendors to determine compatibility between the vehicle make and model and the MRD. Once participants signed the agreement they were asked to go on-line and choose their plan – a combination of MRD type and account manager (ODOT or Sanef). After the accounts were set up by the participants and verified by the account management vendor (i.e., the account name matches the list of approved participants), MRD’s were then mailed directly to the participants by the vendor or by ODOT depending on the participant’s plan choice. The box with the MRD also included instructions for installing the MRD (Figure 11), instructions for downloading and installing / operating the Smartphone RUC app (if applicable), and a card for recording the odometer reading if convenient.

Figure 11

Part of MRD Installation Card



- **Help Desk** (by the Consultant Team) – Participants could call or email with questions or problems (e.g., where to find the OBD-II port on their vehicle and other onboarding issues, equipment issues, errors with invoices, account management issues). The Help Desk was operated Monday through Friday between 7 a.m. and 9 p.m., and on Saturday and Sunday between 10 a.m. and 2 p.m. A Help Desk log was maintained throughout the pilot test. The log documented the date and time of the call/email, the nature of the problem/issue, actions taken to resolve the issue, when the item was closed, and the reason for the closure.

- **RUCPP Communications** (by ODOT and the Consultant Team) – A participant website was maintained with information on the RUC and the pilot test (e.g., summary of plan choices – Figure 12), frequently asked questions (FAQs), and links for setting up an account. Information about the initial RUCPP, including the experience of the participants, was shared with the public. This included these activities:
 - Project blog, where participants shared information about the demonstration with each other and the public.
 - RUCPP project summary, consisting of 4 pages (in color) that provided information about the RUCPP demonstration, lessons learned, successes, and next steps for the program.
 - Media outreach, which included news releases for ODOT’s distribution and briefing packets, including talking points for ODOT’s use in media interviews. This also included tracking media coverage of the pilot test.
 - Presentation materials, including one-page fact sheet, PowerPoint presentation, and a 5-minute educational video.

Figure 12
Summary of Plan Choices (from participant website)

Choosing your plan

To activate your account, you must choose a charging plan. Your charging plan will include a road usage charge service provider – either ODOT or a private provider, Sanef – and a method to report the miles you drive (click on the plan title in the table below).

Need help? Call toll-free 855-797-1265 or RUCPP@odot.state.or.us

Plan Options

	Miles Reported	Invoice	Payment	Online account management	Uses GPS?
ODOT Basic Plan	All	Mailed Monthly	Check	No	No, does not report where miles are driven
ODOT Flat Rate Plan	N/A	Once, at start	Check	No	No device
Sanef Basic Plan	All	Emailed Monthly	credit/debit card	Yes	No, does not report where miles are driven
Sanef Advanced Plan	Public roads in Oregon only	Emailed Monthly	Credit/debit card	Yes	Yes
Sanef Smartphone Plan	With application running, only roads in Oregon; without application running, all roads	Emailed Monthly	Credit/debit card	Yes	Yes, when the application is running

- **Evaluation** (by members of the Consultant Team not involved with the integration or acceptance testing) – The pilot was evaluated as to how well it met the RUCPP objectives, as summarized in Table 2, plus other metrics such as public acceptance (including privacy) and safety of the technology. The evaluation included a review of the acceptance test results and the Help Desk log, plus participant surveys at three points – prior to account set up, at the mid-point of RUCPP operation, and after closeout. A vendor survey was also included.

Table 2
RUCPP Goals¹¹

- Effective demonstration of OBU reporting methods. “Effective” means participating motorists have the following experience:
 - **Choice** between, at minimum, a basic OBU and an advanced OBU (**Do not mandate a GPS box**)
 - Technologies and system are *simple and easy to use*
 - Technologies and system work with *minimal errors and mistakes*
- Motorists have the choice of method to **receive a gas tax** refund from the following options:
 - Automated on tax bill as a credit
 - Other recommended alternatives
- Motorists experience **problem free account processing**.
- Motorists experience the results of an **actual open system**:
 - Choice of account management provider
 - Choice of payment methodologies
- **Choice** of reporting and technologies

3.3.1.1 Pilot Evaluation Results

Per the Final Evaluation Report:

“The objective of the Road Usage Charge Pilot Program (RUCPP) was to demonstrate several choices for measuring and paying a road usage charge that are easy for motorists to perform while maintaining an efficient collection system administered by multiple interoperable providers, including ODOT and private sector entities. The RUCPP, which featured technology and services of three private vendors, successfully measured mileage and distributed invoices to 88 participants (people who volunteered to pay the road usage charge) from three states (Oregon, Washington, and Nevada) over a 4-month period with high levels of ease of compliance, convenience of use, and responsive customer service. By the most important measures—ease of use, motorist choice, and open, interoperable private sector administration—as well as by other measures, the RUCPP was success.”

Looking at some of the individual RUCPP goals from previous Table 2:

- **Choice** – As previously noted (and summarized in previous Figure 12), participants were provided with four different plans from which to choose, providing options with respect to the MRD type and form of payment, plus a fifth plan (Flat Annual RUC) involving no technology.
- **Do not Mandate a GPS Box** – Only the “Advanced MRD” plans included GPS technology. The Basic and Smartphone plans used MRDs without any location capability. This objective is directly related to privacy concerns motorists may have. Per the Evaluation Report, “participants felt that the system protected their privacy well. Moreover, 12 of the 24 participants felt that the RUCPP reduced their concerns about user account privacy, 12 stated that the RUCPP had no impact on their concerns, but none said that the RUCPP raised their concerns.”

¹¹ This list of objectives was included in the RUCPP CONOPS, procurement documents, and participant website.

- **Simple and Easy to Use** – The RUCPP evaluation concluded that the “system was easy to operate, and if a similar system is used for the full implementation, it should also be easy to operate.” The MRD simply plugs into the vehicle’s OBD-II port. After this one-time installation is accomplished, the drivers of the vehicles have no additional interactions with the system (other than paying the invoice when received). The RUCPP Help Desk was very quiet in this regard. Only 11 calls were received during the on-boarding process, and several of these involved questions about where to find the OBD-II port (the location varies from vehicle to vehicle, and in some instances is covered). No participants reported any problems installing the MRD after they had located their vehicles’ OBD-II port.
- **Gas Tax Refund** – This was an important consideration. The RUC is not a new tax; but rather a replacement for the state fuel tax. Credits for the amount of Oregon fuel taxes paid were estimated¹² one of two ways:
 - Based on vehicle information collected and processed by the MRD
 - Based on the average MPG as reported by the U.S. Environmental Protection Agency (EPA) and the chargeable miles driven. (This was necessary for some vehicle types as the MRD could not collect the necessary information)
- **Minimal Errors and Mistakes** – Significant testing was performed on the system components, subsystems, and the RUCPP as a whole before commencing participant on-boarding. Key findings from this testing included:
 - The mileage reported by both the Advanced (with GPS) and Basic (no GPS) MRDs are within 2 percent of odometer readings. Given that the tolerance on odometers is typically +/- 3 percent, this is an excellent result, particularly in light of the fact that the OBD-II standard does not include the actual odometer value. There were some initial accuracy issues with the Smartphone plan in some instances. These are being resolved and additional testing by ODOT is underway.
 - The estimated fuel used, on which the fuel tax credit was calculated, was within 5 percent of the actual fuel consumed.
- **Problem Free Account Processing** – Information from the MRD was used to create monthly invoices for the participants, charging 1.56 cents per mile, less the credit for the estimated state fuel tax. During the RUCPP, the Help Desk received only two calls regarding the accuracy of the invoices which attests to the accuracy and problem free nature of the system.
- **Open System** – The RUCPP project team developed draft system requirements and an interface control document for review by the vendor community. These were updated based on vendor input and included as part of the RUCPP RFP. The prospective vendors also filled out a requirements compliance matrix which was evaluated and formed the basis for subsequent testing. The fact that two different vendors provided mileage reporting devices, which successfully communicated with a third vendor’s account management system utilizing the standard mileage message (and cloud technology as well), indicates the success in achieving this objective.

¹² Fuel used is NOT one of the standard parameters of the OBD-II port, and therefore had to be estimated

The draft Evaluation Report summarizes the overall performance against these objectives as follows:

“Users regard the system as acceptable because it protects privacy, offers multiple reporting and payment choices, and, above all, is easy to use. In particular, pilot participants found mileage reporting equipment easy to install; plan type selections easy to make; and account management and bill payment easy to complete.”

The pilot also helped to improve participant attitudes towards the RUC Concept. In response to the survey question “How has your overall attitude toward road user charges—specifically the mileage tax you are using as part of this pilot program—changed since before the pilot started?”

- 4 “Much More Positive”
- 10 “More Positive”
- 10 “No Change”

The response to the question “Based on your pilot program experience, do you see road user charges as a viable way to pay for road usage?” was

- 19 “Definitely”
- 4 “Probably”
- 1 “Neutral”

For the vehicles participating in the RUCPP, the mileage-based RUC generated slightly more revenue than the fuel tax would have generated. This result helps to confirm that mileage-based charges can generate more revenue from highly fuel-efficient vehicles than the current fuel tax generates from such vehicles.

Being a pilot, the identification of a number of “lessons learned” from the RUCPP was not unexpected. Examples include: not all EVs and HEVs conform to the OBD-II standard, thereby necessitating reverse engineering of the pin configurations and associated vehicle data; the need for enhanced MRD monitoring with respect to the device’s connection to the OBD-II port and the device’s self-monitoring capabilities; and approaches and rules for identifying any missing mileage / transaction records should the MRD become disconnected or otherwise fail. While the Smartphone plan demonstrated the viability of using the phone’s GPS capability to differentiate mileage when so desired by the driver, there were several issues with respect to accuracy, operational configuration, and the connectivity between the MRD and a Smartphone (e.g., pairing the phone with the MRD). Following the completion of the pilot, the vendor upgraded the MRD and Smartphone app to address these issues, with subsequent re-testing by ODOT

These issues were minor compared to the RUCPP’s success in achieving the overall goal of demonstrating the feasibility of the proposed RUC concepts, including user choice, an open system that is easy to use and accurate, and private sector interest and involvement. No major problems or issues were experienced that would preclude moving toward implementation of the actual Oregon RUC system.

3.3.2 New Legislation

HB 2453B was introduced in the 2013 session of the Oregon Legislature. While the bill has not yet been enacted (as of the date of this CONOPS), it has successfully gone through several legislative committees, and has shown to be the most viable approach for accomplishing public policy.

The bill identifies two types of vehicles that will be subject to the road usage charge:

- **Mandatory** – Model year vehicles of 2015 or later with a rating of 55 miles per gallon of gasoline or above, or 55 miles per gallon of gasoline equivalent or above.
- **Voluntary** – A motor vehicle that has a rating of less than 55 miles per gallon of gasoline or less than 55 miles per gallon of gasoline equivalent, and for which the owners / lessees wish to pay the per-mile RUC and have applied to the Oregon Department of Transportation to do so. The maximum number of “volunteer” vehicles is 5000.

This does not include motor vehicles designed to travel with fewer than four wheels in contact with the ground (e.g., motorcycles), nor does it include motor vehicles subject to the Oregon weight-mile tax.

The RUC is to become operative on July 1, 2015; the rate is currently set at 1.55 cents per mile.

Additional details of the legislation are provided in subsequent chapters of this CONOPS, including requirements that:

- Direct ODOT, in consultation, with the Road User Fee Task Force, to establish the methods for identifying the mandatory vehicles;
- Direct ODOT to provide persons liable for the RUC to select a method from among multiple options for collecting and reporting the metered use by a subject vehicle. Considerations in this regard include:
 - ODOT must take into account accuracy of the data collected, privacy options, security, resistance to tampering, ability to audit compliance, and other relevant factors.
 - At least one method of collecting and reporting miles traveled must not use vehicle location technology.
 - Provides an option for mandatory participants (but not voluntary participants) to pay a high flat annual road usage charge in lieu of the per-mile road usage charge. The high flat fee amount would equal the per-mile RUC rate multiplied by 35,000 miles.
 - Permits persons paying the per-mile RUC to obtain a refund of motor vehicle fuel tax and for miles driven on private property.
- ODOT must adopt standards for an open system for technologies and must collaborate with other state agencies to integrate with current or planned information systems.
- ODOT, as part of the Oregon Innovative Partnerships Program, enter into agreements with private sector partners to undertake projects that include the application of technology standards for certification purposes, the collection of metered use data, tax processing and account management as these functions and processes relate to the operation of a road usage charge system.
- ODOT shall provide rules for RUC collection, including penalties and interest. The bill also makes tampering with vehicle metering system an offense.
- Personally identifiable information be protected with respect to disclosure of such information, and also limits retention of any location and daily mileage information except under certain circumstances.

4 System Needs and Operation Considerations

Table 3 summarizes the system needs and policy directives on which the operational concepts for the RUC system have been based. An initial list of needs was developed for the 2011 Preliminary CONOPS, and has been updated slightly based on the results of the RUCPP pilot and HB 2453B. Operational approaches for meeting these needs, along with the issues that still need to be addressed, are discussed in subsequent chapters of this document.

Table 3

Summary of System Needs and Policy Directives for the Oregon Road Usage Charge System

- Choices for RUC Payers
 - Reporting of mileage
 - Invoicing / payment of tax
 - Different providers (and processes) can be used for data collection (vehicle mileage recording) and for account management (invoicing and payment)
 - Fall-back alternatives for those whom electronic reporting is impractical or not feasible (e.g., vehicle incompatibility) so that a true choice is available instead of simply defaulting to the high flat annual road usage charge
- Role of Third Parties/Private Entities to Provide Services
 - Tapping into market forces (via public-private partnerships) to provide data collection and payment services, thereby allowing the public to choose
 - ODOT certification and monitoring of third parties and services provided
- Ease of Use
 - Automation via mileage reporting device and wireless communications
 - Similar to existing processes that are familiar to the public
 - Multiple options of payment choice, including cash, credit/debit card, electronic transfer of funds from bank, and so forth
 - A non-technology option – a high Flat Annual RUC in lieu of the per-mile charge
 - Presentation and explanation of options in a easy-to-understand manner
 - Understanding which makes, models, and years are subject to the RUC as mandatory vehicles
- Technologies and Processes that Work with Minimal Errors and Mistakes
- Protection of Motorist Privacy
 - No government mandate for any particular technology, including GPS or other vehicle location technology
 - Security - protection of personally identifiable information
 - Restrictions and conditions on how long any individual's location data and mileage records can be retained
- Transparency – Understandable to the Public
 - Why the system is being implemented
 - How the mileage rates are determined and assessed
 - How much an individual actually pays

Table 3
Summary of System Needs and Policy Directives for the Oregon Road Usage Charge System

- Why some vehicles are considered “mandatory”
- Refunds and Credits
 - No charge for mileage reported as out-of-state travel or travel on private property
 - Refund /credit/adjustment of motor vehicle fuel tax paid
- Effective System Compliance/Minimal Evasion
 - Tamper-resistant hardware and software
 - Auditability
 - Enforcement
- Low Costs Relative to Revenues Raised
 - Capital costs for implementation
 - Annual operating and maintenance costs (including enforcement)
 - Minimal administrative burden on users and private sector
 - Ease of data integration
- “Open” System Architectures and Technology Platform
 - Technology can evolve with motorist preferences and market capabilities
 - Use of standards – not locked into a single provider for any system components
 - Future scalability
 - Ability to be a value added to other vehicle-related services and/ or use data already collected by these other services
- Future Expandability
 - All vehicle types
 - Zone capability
 - Regional compatibility – connections to other states with RUC systems for sharing information and revenue transfers

A common theme underlying all of these needs is **public acceptance**. Replacing one form of revenue generation with another imposes a major change on the motoring public. As noted in one of the references, “People generally do not like circumstances that require change—in this case, a crumbling and crowded road system with dwindling available revenues during a time of economic crisis—and therefore go through the stages of grief when presented with the inevitability of change: denial, anger, bargaining, depression, and acceptance. No one should expect the change to a mileage charging system for roads to undergo any different process.”¹³

What works best from a purely technical and systems perspective may not work from the public’s perspective. Many valuable lessons were learned during the 2007 Road User Fee Pilot Program and further verified as part of the 2012 RUCPP in this regard, including the need to give motorists several choices in terms of approaches and technologies for measuring and reporting miles driven. This includes

¹³ “Discerning the Pathway to Implementation of a National Mileage-Based Charging System” (2009); James Whitty and John R. Svadlenak; Commissioned by Transportation Research Board.

a “non-location” option (no GPS mandate) and options for invoicing and payment of the RUC. It is also critical to provide RUC services through nongovernmental entities to the greatest extent possible. The use of such certified service providers not only provides RUC payers with a choice, but also helps dispel the perception that a mileage-based RUC would necessitate a new and expensive governmental bureaucracy. System efficiency and low relative costs also play an important role in this regard.

Another important element of public acceptance is compliance and enforcement. It is important that the system make evasion and avoidance difficult, and that it do so in a cost-effective manner. Vehicle owners and lessees (i.e., RUC payers) paying the mileage-based RUC will want to ensure all such individuals pay their fair share. They will not tolerate a system that permits a substantial number of free riders or scam artists, or a mileage-collection technology that can be easily tampered with.

4.1 Vision and Goals

The following vision statement for the Oregon RUC system was developed as part of the Preliminary CONOPS, and has been revised slightly as a result of the lessons learned from the RUCPP Pilot and current legislation:

The Oregon Road Usage Charge System vision is a reliable, easy-to-use, low cost, enforceable, and publicly acceptable “open” system that replaces the fuel tax; applying a charge – based on measured road use – to highly fuel efficient vehicles, thereby preserving cost responsibility and providing the means to support the state’s system of roads and highways. The system provides the owners and drivers of these vehicles with choices as to how the charge is measured and collected, is capable of charging for only those miles driven on public roads within the state, and protects the vehicle owners’ and drivers’ privacy. The system also incorporates public-private partnerships to manage the various road usage charge functions and processes.

The vision statement, coupled with the system needs and policy directives, leads to the following RUC system goals¹⁴:

- Implement a **cost-effective and transparent system** for collecting the road usage charge, one that is highly automated and is easy to use and understand.
- **Provide RUC payers with choices** regarding road usage / mileage reporting and methods for invoicing and payment.
- **Establish public-private partnerships** to develop a system that allows RUC payers to interface with the certified service provider(s) of their choice to report mileage and/or to provide invoicing and payment.
- Implement a **government system as an alternative choice** and “provider of last resort” for basic measuring and invoicing activities.
- **Protect privacy**, including restrictions on the release of personally identifiable information, conditions for how long an individual’s mileage information can be retained, and not mandating location-based charging systems (but allow certified service providers to use location-based charging technology for those travelers who prefer this method of reporting.)
- **Charge Oregon residents only for in-state travel**, unless travelers report mileage undifferentiated by geographic location (in which case, all recorded mileage will be assumed to have been driven within the state).

¹⁴ As was the case with the Needs and Vision Statement, these objectives represent an update to the objectives identified in the 2011 Preliminary CONOPS

- Provide **credits or refunds for travel on private property** within Oregon by residents.
- Provide **credits or refunds for fuel taxes paid** for vehicles that are subject to the RUC.
- **Ensure efficient account management operations** that provide a convenient way for taxpayers to access, administer, and make inquiries regarding their mileage-based RUC and the processes by which these charges are calculated.
- **Base the system design on an open architecture using common standards** for the system components that need to be interoperable for an efficient, cost-effective, and market-driven system. This also includes establishing guidelines, defining requirements, and defining a certification process for potential nongovernment third parties that are interested in participating and providing services for the RUC system. It also permits the RUC charge to be a value-added element to other vehicle-related services provided by CSPs.
- **Provide viable audit trail** to ensure proper recording of mileage and associated payments, by RUC payers and CSPs.
- **Promote compliance** through a combination of education, regular audits (and associated audit trail), tamper-proof hardware and software, and enforcement activities to minimize reporting and payment violations.
- Develop a system that will be **compatible with future RUC systems in other states**.
- Develop a system design that does **not preclude future expansion** and/or collection of a variety of transportation charges, including, but not limited to, zone-based charges, facility tolls, and local options.

An overview of the system functions and system concepts for achieving these goals is provided in the next chapter.

5 User-Oriented Operational Description

As discussed in the previous chapter, the vision for the Oregon Road Usage Charge (RUC) System is a publicly acceptable “open” system that applies a charge on the basis of measured road use (i.e., miles traveled), distributing the responsibility for costs equitably while providing the means to support the state road and highway system. Initially, this RUC would apply to owners and lessees of highly fuel efficient vehicles – those 2015 (and beyond) models that are rated at 55 MPG (or 55 MPGe) or greater (“mandatory vehicles”); plus a voluntary system for owners or lessees of vehicles that are rated at less than 55 MPG who wish to pay the RUC, and have applied to the Oregon Department of Transportation to do so. Moreover, the system would provide vehicle owners and lessees (i.e., RUC payers) with choices on how the mileage-based charges would be measured and collected, and on how the RUC would be paid.

5.1 System Entities and Stakeholders

A stakeholder is any person or group with a direct interest (a “stake” as it were) in the RUC system, providing or otherwise involved in one or more of the system functions (to be discussed in the next section). Key stakeholders include the following:

- Oregon Department of Transportation (ODOT):** responsible for the operation and maintenance of the major (i.e., high volume) roads, bridges, tunnels, and related facilities in the state of Oregon. In the context of the RUC system, ODOT would continue its current function as the state’s revenue-charging entity and collection agency for fuel taxes, including ensuring the funds go to the state treasury (i.e., the Oregon Highway Trust Fund). In this role, ODOT will be responsible for adopting standards and developing requirements for an open system, for identifying other standards and guidelines for certifying private entities as service providers, for the RUC Accounting functions (including identifying which specific vehicle makes, models and years are subject to the RUC), for the management and oversight of contracts with certification entities and Certified Service Providers (CSPs), for ensuring privacy of personally identifiable information included in the RUC system, and for system compliance activities. ODOT will also provide basic RUC services such as account management for those RUC payers who choose to use ODOT (rather than a private entity / CSP) for these services or as a “provider of last resort”.
- Driver and Motor Vehicle Services Division (DMV):** a branch of ODOT whose mission is to promote driver safety, protect financial and ownership interests in vehicles (registration and title), and provide driver’s licenses and identification cards for Oregon residents. DMV will continue in this role as part of the RUC system, providing pertinent information (e.g., name and address of owner, date of sale of vehicles, vehicle make, model, year and VIN, and odometer readings at time of sale or resale (i.e., change in title) to the ODOT RUC Accounting function.
- Office of the State Treasurer:** An organization within the Oregon state government with a wide range of financial responsibilities, including managing the investment of state funds, issuing all state bonds, and serving as the central bank for state agencies (including RUC revenues).
- Road User Fee Task Force (RUFTF):** Established by the Oregon legislature with the mandate “to develop a design for revenue collection for Oregon’s roads and highways that will replace the current system for revenue collection”, the RUFTF includes representatives from the Oregon State Senate and House, the Transportation Commission, other organizations (e.g., AAA,

Environmental), local elected officials, and citizens. Working with ODOT, it establishes policy for road usage charging.

- **RUC payers:** the owners and lessees of vehicles subject to the mileage tax and payment thereof. RUC payers with a **mandated vehicle** (i.e., model year 2015 or later, with a rating of 55 MPG / MPGe or greater) will be responsible for notifying ODOT that the vehicle is subject to the per-mile road usage charge; choosing their desired method for mileage reporting, account management and payment; and setting up a RUC system account with a CSP or with ODOT. RUC payers with a **volunteer vehicle** will be responsible for applying to ODOT to be included in the RUC system. Unless they have selected the Flat Annual RUC option or a manual fallback approach (available only for mandated vehicles), RUC payers will also be responsible for ensuring that their vehicles are equipped with technology (mileage reporting device [MRD] or telematics) to automatically measure and electronically report the number of miles traveled. They are also responsible for paying the appropriate charges for these miles.
- **Certified Service Providers (CSPs):** Private (nongovernmental) entities that have entered into an agreement with ODOT for reporting metered use by a subject vehicle or for administrative services related to the collection of per-mile road usage charges. Several different types of CSPs are envisioned for the RUC, providing RUC hardware, software and services as listed below. It is expected that many of these CSPs will be entities that owners and drivers already entrust with financial and private information such as mobile phone and credit card providers, banks and financial institutions, auto manufacturers and dealers, navigation unit providers, and insurance companies. Moreover, the same entity may perform multiple CSP functions as noted above, such as the mileage reporting vendor also providing data collection functions, and a communications provider also providing account management functions. CSP types may include:
 - **Mileage Reporting Vendor** – A private entity that provides mileage reporting devices and associated software (e.g., RUC phone apps) to RUC payers, or to ODOT or other CSPs for resale to RUC payers. This CSP may provide MRDs for which the primary purpose is not RUC (e.g., pay as you drive insurance), but nonetheless provide RUC functionality as a value-added feature. It is emphasized that ODOT will not develop or manufacture MRDs.
 - **Automotive Telematics Service Provider** – A private entity, including an automobile manufacturer or automotive supply chain vendor, that has access to the vehicle’s internal operating data and provides in-vehicle services (e.g., On-Star, Sync) using the vehicle’s data and other information. The RUC system would be provided access to those vehicle data necessary to accurately calculate the RUC (e.g., VIN, mileage driven in state / out of state, fuel consumed), most likely via a data collector. The telematics provider may offer RUC as a value added service to its customers.
 - **Data Collector** – A private entity that receives mileage information and other RUC-related data from the vehicle, either via the MRD or vehicle telematics. The data collector can collect data in multiple proprietary formats (e.g., from different vendors’ MRDs and / or telematics), aggregate the data, and send the information to one or more account management CSPs using the standard RUC message format.
 - **Account Manager** – A private entity that provides a variety of transaction processing and account management services for RUC payers, including setting up RUC accounts, calculating the road usage charge less any gas tax credits, issuing RUC invoices and statements, receiving

payments, managing accounts receivables, transmitting collected monies to the state treasury, and supporting audit activities.

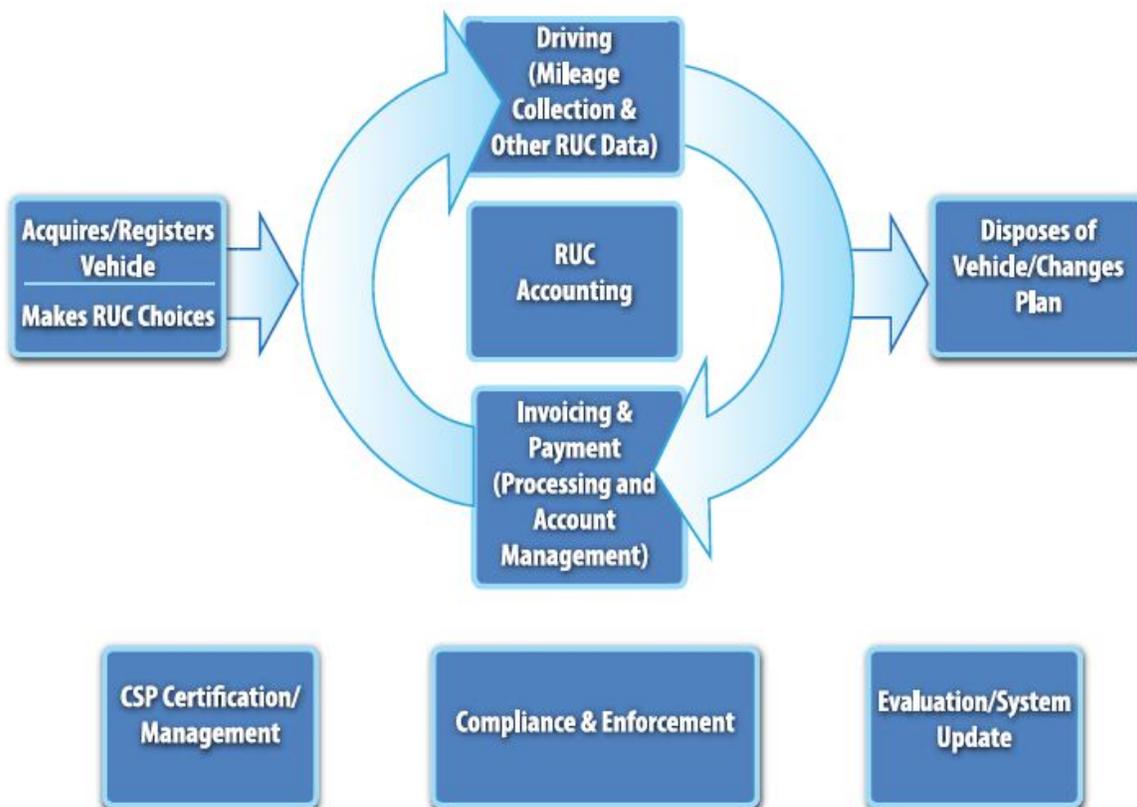
- **Communications Provider** – A private entity that provides wireless communications services for the transmission of RUC data to and from the subject vehicles. The wireless providers will also likely support other vehicle services for which the RUC is considered as a value added.
- **Certification Entity (CE):** CSPs will need to be certified by ODOT before they can provide hardware or services for the RUC system. ODOT may perform this certification or use a certification entity – an independent body that will, on behalf of ODOT, test and evaluate RUC products and services offered by potential CSPs, and provide written assurance (a certificate) that the product and / or service in question meets specific requirements and can be used in the RUC system.
- **Auto Manufacturers and Dealers:** Provide and sell the vehicles that are subject to the RUC. Auto manufacturers provide the OBD-II port and associated data (as well as other data that may not be part of the OBD-II standard). The auto manufacturers also provide vehicle telematics and the associated information for a growing number of vehicle makes and models – information that is required for RUC system operations. Auto dealers, in addition to selling vehicles, assist RUC payers with the registration process when selling or leasing a vehicle; and it is envisioned that they will also assist RUC payers in identifying which vehicles are subject to the RUC, in choosing a method of mileage reporting and setting up the RUC account, and in notifying ODOT that the account has been set up. As many auto dealers also provide service and maintenance in vehicles, they will also need to re-install the MRD following service.
- **Fleet Owners:** That have multiple drivers using the same vehicle (e.g., rental car companies, large organizations with pool vehicles, ODOT) will function as RUC payers for their fleets.
- **Other States:** Several states have expressed interest in the RUC concepts. To ensure efficient system operations, and to maximize interest by the private sector in providing RUC hardware, software, and services, it is important that the RUC systems in these other states and in Oregon be compatible with one another. This is also an important consideration for exchanging information between states, such that out-of-state drivers could be appropriately charged for mileage driven on public roads within Oregon.

Additional stakeholders will play an important role in finalizing the system concept and promoting public acceptance, including the state legislature, business groups such as American Automobile Association (AAA), chambers of commerce, and the U.S. Department of Transportation (USDOT).

5.2 System Processes and Functions

To achieve the vision and goals identified in the previous section, the RUC system must accommodate several functions and processes that interact with each other as shown in Figure 13.

Figure 13
Oregon Road Usage Charge Conceptual Configuration



Those functions and processes connected with arrows represent the charging process as discussed below. Additional information on these processes is provided in Chapter 6 and in Chapter 7 on RUC scenarios.

5.2.1 Acquires and Registers Vehicle

The box entitled “Acquires / Registers Vehicle” focuses on the processes by which a subject vehicle becomes part of the RUC system. Two types of subject vehicles are included in the current legislation, with the processes for “registering” each type into the RUC summarized below.

5.2.1.1 Mandatory Vehicles

Just as all vehicles owned or leased by Oregon residents must be registered with the Driver and Motor Vehicle Services Division (DMV) of ODOT, those vehicles that are also subject to the RUC under the mandatory requirements (i.e., model year 2015 or later, and rated at 55 MPG / MPGe or greater) will also need to have RUC accounts set up by the vehicle owner or lessee, with the account linked to the vehicle identification number (VIN). The specific relationships and sequence of events between acquiring a mandatory subject vehicle, registering the vehicle with DMV, and setting up a RUC account (including selecting the methods for mileage reporting and account management) still needs to be finalized. HB 2453B does provide some guidance in this regard, such as:

- ODOT, in consultation with the RUFTF, is required to establish the methods for identifying the motor vehicles that are mandatory vehicles (i.e., model year 2015 and beyond vehicles that are rated at 55 MPG or MPGe or greater). In addition, it is envisioned that the list of these subject

vehicle makes and models will be continually updated and made available to DMV and to auto dealers throughout the state.

- As soon as “applicable”, individuals are required to notify ODOT that they are a registered owner or lessee of a mandatory vehicle; and to identify the method they are choosing for reporting their mileage.
- ODOT (i.e., DMV) “may not” issue registration for the subject vehicle if these notifications (i.e., vehicle is subject to the RUC, and the RUC choice) have not been accomplished. At the same time, the legislation stipulates that ODOT “shall determine by rule what constitutes proof of notification.”

It is currently envisioned that the RUC payer will not be required to actually choose a mileage reporting method or an account manager at the same time that the mandatory subject vehicle is purchased and registered; but rather, the owner / lessee will acknowledge (e.g., signed form) that their new vehicle is subject to the RUC, and that they are required to choose a method and set up an account (and to notify ODOT of these choices) within a stipulated (by rule) period of time (e.g., 3 weeks) following the vehicle purchase or lease. If they do not choose a RUC approach and notify ODOT of their choices, it will be assumed that they have opted for a “flat rate” option (as discussed in greater detail in the next section).

Several process specifics will need to be worked out over the next year for the mandatory vehicles, such as:

- Establishing the methods for identifying those motor vehicles (year, make, model, engine type) that are mandatory vehicles¹⁵, and the processes and mechanisms for updating this list and providing the information to DMV and to dealers (e.g., on-line tool). Similarly, it will also be necessary to provide information regarding the RUC program, and any subsequent updates, to the dealers so they can provide it to their customers.
- Developing and setting up an on-line tool for use by dealers (and possibly by DMV) by which the list of mandated vehicles and other RUC information can be accessed, and the new owners and lessees can “notify” ODOT via an on-line form.
- Developing a process by which new vehicle owners and lessees can challenge the inclusion of their specific vehicle as part of the mandatory RUC (e.g., showing the vehicle’s EPA sticker)
- Modifying DMV forms to include “mandatory” and “voluntary” RUC vehicles

It is envisioned that the automobile dealers will become more involved in the RUC process as the system evolves, including service offerings for mileage reporting and account management to their customers.

5.2.1.2 Voluntary Vehicles

This “registration” (i.e., RUC enrollment) process will likely be different for the voluntary vehicles, assuming that these vehicles will already have been purchased and registered with DMV¹⁶. Per HB 2453B, a person wishing to pay the per-mile RUC for a voluntary vehicle must apply to ODOT on an ODOT-prescribed form. Moreover, the legislation requires ODOT to approve a “valid and complete application” if:

¹⁵ For most vehicles, the MPG rating will be determined from the VIN; but there may be some vehicles where this is not possible.

¹⁶ HB 2453B does not preclude an individual from volunteering for the RUC at the time of purchasing, leasing, and registering a vehicle; although it may be beneficial to keep the mandated and voluntary processes separate, at least initially, from the auto dealer’s perspective.

- The applicant is the registered owner or lessee of a voluntary vehicle,
- The voluntary vehicle is equipped with a method for collecting and reporting the metered use (i.e., mileage) by the voluntary vehicle,
- The voluntary vehicle has a gross vehicle weight rating of 10,000 pounds or less, and
- Approval does not cause the number of voluntary vehicles active in the RUC program to exceed 5,000.

In addition to those near-term activities associated with finalizing the registration processes for mandatory vehicles, ODOT will also need to develop the application form for voluntary participants. It is envisioned that this form will include minimum vehicle criteria that constitute a “valid” application, such as:

- Compatibility with available mileage reporting devices or telematics data protocols – In general, most vehicles manufactured after 2000 have a compatible OBD-II port for existing MRDs (although not all). It is currently uncertain which vehicle telematics will be compatible with the RUC, or when such compatibility will occur.
- RUC as a value added to an existing service – If the vehicle is already signed up for pay-as-you-drive (PAYD) insurance or other concierge service that requires installation of a device in the OBD-II port, the other service will need to also offer RUC data as a value added feature.
- Average gas mileage – As the estimated amount of fuel tax paid for a subject vehicle is to be credited or refunded to the RUC payer, drivers of low-mileage volunteer vehicles (i.e., less than approximately 19 MPG) will end up with a net refund relative to the mileage-based RUC. Having 5000 volunteers as part of the initial RUC system will help promote private sector interest; but too many vehicles receiving a net refund will defeat the long term goal of achieving stability for transportation funding. Accordingly, ODOT may consider a minimum allowable MPG for volunteer vehicles.

5.2.2 Makes RUC Choices

A major system goal is to provide RUC payers with choices regarding road usage / mileage reporting and methods for invoicing and payment. The choice process will involve several steps and options as summarized below.

5.2.2.1 Mileage Reporting Approach

HB 2453B requires ODOT, in consultation with the RUFTF, to “establish methods for recording and reporting the number of miles that subject vehicles travel on highways.” Considerations in this regard are to include:

- The accuracy of the data collected,
- Privacy options for persons liable for the per-mile road usage charge,
- The security of the technology,
- The resistance of the technology to tampering, and
- The ability to audit compliance;

Moreover, the legislation requires ODOT to “establish at least one method of collecting and reporting the number of miles traveled by a subject vehicle that does not use vehicle location technology.” The following mileage reporting approaches are envisioned for the RUC system.

- **Undifferentiated Mileage** – This approach for measuring and reporting vehicle mileage involve a “**Basic Mileage Reporting Device (MRD)**” and /or software (e.g., **telematics**) that obtains data

from the vehicle to calculate the mileage, or reads the electronic odometer via the vehicle telematics capabilities. The basic MRD will also obtain information on fuel usage (for HEVs and ICD vehicles that use gasoline or diesel fuel and are subject to the RUC) for the purpose of establishing the amount of fuel tax credits or refunds. The Basic MRD possesses no location-determination electronics or capability such as GPS. Such an approach should help alleviate the public's concerns about privacy. However, an RUC payer choosing this "total mileage" approach will be charged for all miles the vehicle is driven—undifferentiated by geographic location—including any miles driven outside of the state.

- **Differentiated Mileage** – If RUC payers want to differentiate their mileage by geographic location, including out of state travel, they can choose a location-based measuring and reporting approach. This approach includes an "**Advanced Mileage Reporting Device (MRD)**" and /or software (e.g., **telematics**) with location-determining technology. There are two approaches in this regard: 1) is for the MRD to measure mileage using vehicle information from the OBD-II port (as is done with the Basic MRD), or to use vehicle telematics to directly read the odometer, with the location capability of the MRD / telematics recognizing if and when the vehicle is being driven outside of Oregon or on private property; and 2) using the location capability of the MRD / telematics to directly measure the mileage driven and to determine which of these miles occur on public roads in Oregon. Regardless, the RUC payer will only be charged for miles driven on public roads in Oregon.¹⁷ Another approach
- **Switchable** – This approach allows to the RUC payer to switch between undifferentiated and differentiated mileage reporting depending on their circumstances. For example, an individual might drive outside of Oregon quite frequently, but does not want to have a dedicated "Advanced" mileage reporting approach due to concerns with privacy¹⁸. This RUC payer could use a basic approach for in-state driving, and "switch" to an advanced approach when leaving the state. One method for switching is a Basic MRD that can connect to a driver's Smartphone (e.g., Android-based or iPhone) or a tablet computer via Bluetooth or other short-range wireless connection. When paired, the MRD uses the GPS capability of the phone and an RUC "app" on the phone to differentiate the mileage¹⁹. Another possible approach is an actual switch on the MRD itself that allows the driver to activate / deactivate the device's GPS capability.

In addition to the vehicle mileage, the MRD will also collect the VIN and data on the vehicle's fuel consumption. The fuel consumption data are important so that a credit for the Oregon gas tax paid can be provided to the RUC payer against the Road Usage Charge. It is emphasized that the RUC is not a new, additional tax; but a replacement for the fuel tax. Additional information regarding the MRD is provided in Chapter 6.

¹⁷ Per HB 2453B , ODOT is to assume all miles are driven on Oregon highways unless the owner / lessee presents evidence otherwise, with a rule as to what constitutes this evidence to be established by ODOT. It is envisioned that the use of an Advanced MRD and differentiated mileage would qualify as "evidence".

¹⁸ The RUC system requirements in mileage messages have been developed such that location data are NOT transmitted to the ODOT account management function. The mileage message only contains the total mileage and the chargeable mileage; not where the mileage occurred, thereby promoting privacy.

¹⁹ This approach was included in the RUCPP for Android-based phones. The phone was also used as the communications device for transmitting the mileage message and other data for transaction processing. It was determined that, for the RUC, the MRD needs to be the communications device such that mileage and related RUC data can be transmitted when the phone is not present in the vehicle.

5.2.2.2 Mileage Reporting Technology

It is envisioned that several technological approaches will be available for the mileage reporting function, including:

- **RUC-Specific MRD** – This involves a device that plugs into the vehicle’s OBD-II port and is used exclusively for the RUC system. This was the approach used in the RUCPP (Figure 14).

Figure 14
Installation of MRD in the Vehicle’s OBD-II Port



- **Multi-Function MRD** – One of the MRD vendors for the RUCPP is also developing devices for the pay as you drive (PAYD) insurance industry (e.g., Travelers, USAA, and others); and the RUCPP MRD was based on these designs.²⁰ PAYD insurance concepts are expanding to include a device continually installed in the OBD-II port²¹. Moreover, “concierge” vehicle services are being introduced in the market that use a similar type of device plugged into the OBD-II port to provide a variety of services such as PAYD quotes, information on the condition of the vehicle as it takes to the road, safety and security, and monitoring the vehicle owner’s teen drivers. There is only a single OBD-II port in a vehicle, and assuming these other vehicle services grow, it will likely be necessary for the RUC to become another value added service to the insurance and other vehicle services, providing the multiple functions in a single MRD.
- **Factory Installed Telematics** – The long term vision is that ultimately, there will be no need for an external plug-in MRD. The data and other information required for road usage charging and other vehicle-related services will be provided via the vehicle’s internal telematics. Examples of factory-installed telematics include GM’s OnStar, Ford’s Sync, Mercedes’ Embrace, or Toyota’s Entune. RUC would become a value added to these existing services.

²⁰ The Progressive Snapshot device is another example of an insurance-based device that plugs into the OBD-II port, although there are significant differences in functionality between Snapshot and RUC. The RUC-based device only measures mileage and fuel consumption; while the Snapshot device – which is installed in the OBD-II port for a fixed period of time – is used to identify your driving behavior (e.g., how often you slam on the breaks, how often you drive between midnight and 4 AM] in addition to mileage to set your insurance rate.)

²¹ Travelers Insurance is advertising theirs for low mileage vehicles (less than 13,000 miles per year; while USAA is promoting theirs for teen drivers in the family.

The RUTTF has emphasized that the RUC system should take greatest advantage of the technology already developed by private industry; and that the program should employ private industry solutions wherever practical from policy and economical perspectives to promote user choice and to minimize disruptions to the market. As such, it is assumed that all of these technology-related choices will be provided by the private sector – a seemingly realistic assumption given the level of vendor interest in the RUCPP. ODOT’s only involvement will be in overseeing their certification for use in the RUC system.

5.2.2.3 Flat Annual Road Usage Charge

Some RUC payers may not want any additional technology in their vehicle to support the RUC (or other services for that matter). These individuals may choose the “Flat Annual RUC” option. HB 2453B permits a registered owner or lessee of a subject vehicle to pay a Flat Annual RUC in lieu of paying a per-mile charge. The Flat Annual RUC is an amount equal to the product of 1.55 cents multiplied by 35,000 miles – \$542 per year. No credit or refund for any gas taxes paid is provided under this approach. In essence, the Flat Annual RUC represents the purchase of the right to drive unlimited miles for a year. While this concept is envisioned as an annual RUC, payment of the charge in installments would likely be permitted (with appropriate carrying charges).

It is emphasized that, per the legislation, the “Flat Annual RUC” option is only available for mandatory vehicles – the registered owner or lessee of a voluntary vehicle may not choose the flat annual road usage charge in lieu of the per-mile road usage charge. Additionally, for-hire carriers cannot select the Flat Annual RUC.

5.2.2.4 Fallback Options

As was learned during the RUCPP, some individuals who desire to use technology to automatically measure and report their miles may not be able to due to a variety of reasons – for example, the OBD-II port may be damaged (i.e., cannot securely hold the MRD and / or provide the required data), the OBD-II port may be located such that an installed MRD interferes with safe driving, the vehicle may not conform to the OBD-II standard (and the necessary reverse engineering has not yet been performed to identify the data associated with each pin in the port), or the vehicle may not have an OBD-II port and vehicle telematics is not an option. Under such circumstances, the RUC payer should not be required to pay the Flat Annual RUC as their only remaining option. Accordingly, these RUC payers will be provided with fallback options for reporting their mileage. Possibilities in this regard may include:

- Manual mileage reporting, where the RUC payer, or other authorized entity, reads and reports the vehicle’s odometer reading on a recurring (e.g., annual) basis.
- A permanently installed GPS device with the VIN and other pertinent information hard coded into the device (i.e., no connection to the OBD-II is necessary).

It is emphasized that these mileage reporting options are **not a choice**; but rather a fallback condition whenever a RUC payer desires to choose and use an automated approach, but it is not technically feasible for the individual’s vehicle. Additional information on potential manual mileage reporting methods is provided in Chapter 6.

5.2.2.5 Account Management

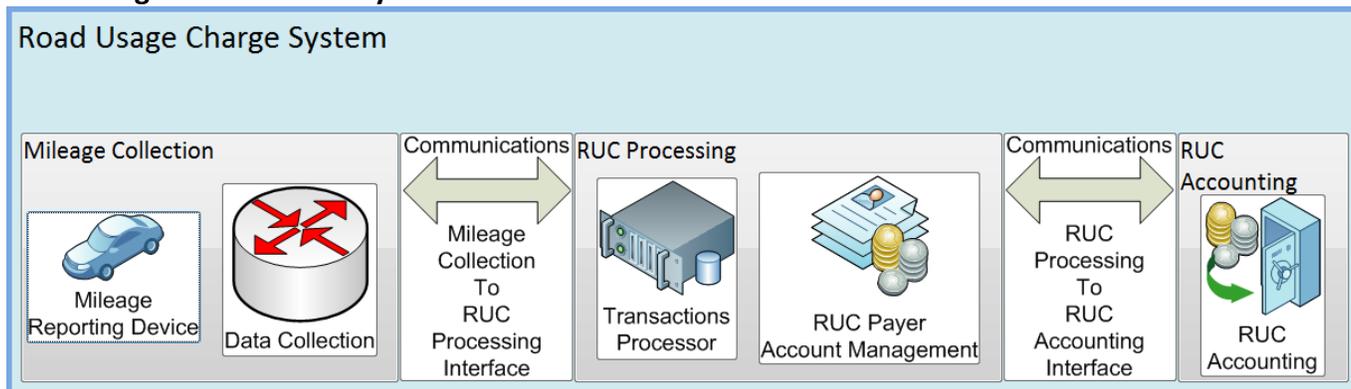
The RUC payer will also choose an entity to manage their RUC account, including methods for invoicing and payment. Two basic choices are envisioned.

- **Private Entity** – A CSP that has been certified to provide account management services for the RUC system. It is envisioned that these account management CSPs will provide additional services – not just the RUC. In fact, the RUC may be another value-added service already provided by the CSP (e.g., PAYD insurance, traveler information, concierge services). These CSPs may also offer a complete “bundled” service incorporating the mileage reporting and account management functions. Additionally, a RUC payer may choose a specific CSP with whom they are already conducting business. Based on the RUCPP experience, these account management CSPs will provide electronic invoicing and payment by credit or debit card through their respective websites. These CSPs will also provide their own Help Desk and related RUC payer services.
- **ODOT** – ODOT will also provide account management services under the following circumstances:
 - For RUC payers who choose a Basic MRD and who do not want a private entity to manage their accounts. The broad concept is that ODOT will not offer nor generally handle accounts involving an Advanced or Switchable MRD, or in-vehicle telematics (i.e., options involving location information). It is noted that in some special circumstances, ODOT may manage such accounts – for example, a potential scenario is where an account management CSP is decertified or goes out of business, and ODOT may need to assume the management of these accounts (including ones using advanced MRDs) for an interim period.
 - For RUC payers who cannot qualify for a CSP account. Potential scenarios where ODOT would become the “provider of last resort” include an individual who chooses the Flat Annual RUC, an individual who is eligible for a fallback option such as manual mileage reporting, and an individual who wishes to pay the RUC by check or cash.

5.2.3 Driving / Measuring Miles and Invoicing / Payment

Once the RUC payer has made the necessary choices and set up the RUC account, the on-going process of driving, measuring miles, invoicing, and paying the RUC will commence and continue for as long as the RUC payer remains an Oregon resident and owns or leases the subject vehicle. This process is shown in greater detail in Figure 15, with the activities described below.

Figure 15
RUC Configuration and Subsystems



5.2.3.1 Mileage Collection Subsystem

The first main block of the RUC configuration is the mileage collection subsystem. The mileage collection subsystem interfaces with the vehicle – via a mileage reporting device (MRD) or in-vehicle telematics – to measure and record the miles traveled each day by the vehicle. The mileage reporting function also automatically identifies and transmits the VIN number. Additional data collected include an estimate of fuel usage (for vehicles using gasoline or diesel) and connectivity (to ensure that the MRD has not been removed or been dislodged). Additional information may also be collected by an account management CSP – with the consent of the RUC payer – to provide additional non-RUC services for the RUC payer.

In addition to the mileage reporting functionality, the mileage collection subsystem also includes the data collection component. The data collection component takes the collected information, stores the data, converts the information into the standard format mileage message (as part of an open system), and transmits this standard message to the road charge processing subsystem. The data collection component may reside in the vehicle (i.e., be integrated within the MRD / vehicle telematics), transmitting the standard mileage message to the road charge processing subsystem directly from the vehicle. Alternatively, the data collection component may reside in an external location, such as a data collector's or account manager's facility.

Another potential function of the data collection component is that of “data aggregation”. A data aggregator would provide the data collection functions as an independent (and certified) service provider between the vehicle telematics (and possibly MRDs) and the road charge processing subsystem. The data aggregator would collect RUC information directly from a vehicle's telematics capabilities utilizing the manufacturer's or OEM's particular proprietary message format and communications infrastructure. The data aggregator would then parse the particular vehicle's VIN, mileage travelled (with data and time stamp), fuel consumption, and state traveled (if applicable), and then route that information to an account management CSP using the open standards messaging format as defined by ODOT.

5.2.3.2 Road Charge Processing

The second main block of the RUC configuration is the road charge processing subsystem. The road charge processing subsystem provides the RUC rate determination and transaction processing, RUC invoicing to RUC payers, and the associated account management functions. The road charge processing Subsystem consists of two major components:

- **Transactions processor** is an automated process that is responsible for receiving the mileage (and other) data from the mileage collection subsystem, applying the applicable RUC rate(s) to the chargeable mileage, and calculating the road usage charge and any credits for the estimated amount of Oregon gas tax paid during the period. Another transaction processing function is to estimate / extrapolate any missing mileage due to a non-functioning MRD.
- **Account management** activities are numerous, including:
 - Account registration and set up (with each account corresponding to a specific vehicle and MRD).
 - Charging miles to that account while also accommodating any credits for fuel taxes paid as well as travel out of state or on private property.
 - Issuing invoices.
 - Collecting money via a variety of payment types (e.g., credit and debit cards, electronic transfers).
 - Managing accounts receivable and collection of overdue taxes and any fines.

- Transferring the collected RUC payments to the Oregon Department of Treasury.
- Reconciling and auditing road usage data and revenue collection and distribution
- Customer Relationship Management (CRM) such as web-based interface for RUC payers to query and check the status of their respective accounts, Help Desk operations, and other means for disseminating information to current and future customers.
- Modifying and closing out accounts
- Sending reports to the Road Usage Charge Accounting Subsystem.
- Configuration management

It is envisioned that multiple Certified Service Providers will offer the transaction processing and account management functions, often in parallel with mileage collection services including providing MRDs to RUC payers. Moreover, as previously discussed, it is envisioned that the RUC services will be offered by CSPs as a “value-added” to other driver and vehicle-oriented services already in operation.

ODOT will also offer basic transaction processing and account management functions for those RUC payers that do not want a private entity managing their accounts, for those RUC payers who choose the Flat Annual RUC or who have no other alternative than manual mileage reporting, and as the “provider of last resort” for those RUC payers who cannot qualify for a CSP account.

One account management function that has not yet been defined is the reporting periods for the RUC. HB 2453B directs ODOT to establish, by rule, these reporting periods, taking into consideration the following:

- The effort required by registered owners or lessees to report metered use and to pay the per-mile road usage charge,
- The amount of the per-mile road usage charge owed,
- The cost to the registered owner or lessee of reporting metered use and of paying the per-mile road usage charge,
- The administrative cost to the department, and
- Other relevant factors that ODOT deems important.

5.2.3.3 Road Usage Charge Accounting (RUCA)

The third and final main block of the RUC configuration is the RUC accounting (RUCA) subsystem – also shown in previous Figure 13 in the center of the circular arrows. This is an ODOT function that rolls up pertinent data on all RUC payers into one central database and performs accounting for the program, including checking to ensure that all mandated subject vehicles are indeed participating in the RUC program. The RUCA receives account information from the road charge processing subsystems, maintains the master set of accounts, and ensures that the RUC payments are ultimately provided to the state treasury. The RUCA also provides auditing and reconciliation functions for the RUC, supports enforcement activities, measures and evaluates RUC performance, provides liaison activities with DMV, and works with RUFFT to recommend and set the per mile rate and other RUC fees.

5.2.4 Dispose of Vehicle

The processes of driving and measuring / reporting miles, and subsequent invoicing and payment continues until the RUC payer disposes of the subject vehicle (e.g., the lease expires or the vehicle is sold) or moves out of state. A RUC payer may also end **voluntary** participation in the RUC program at any time by notifying ODOT and paying any outstanding amount of the road usage charge for metered use by the person’s voluntary vehicle. The processes may also change should the RUC payer decide to

choose another mileage reporting approach, technology, and or account management CSP. The RUC Accounting subsystem, coordinating with DMV and CSPs, will be the tracker of all such changes via the master set of accounts.

5.2.5 Other RUC Functions

Previous Figure 13 shows other RUC activities and processes along the bottom of the figure. These are summarized below, with more detailed discussions included in the next chapter.

5.2.5.1 CSP Certification / Management

CSP certification activities include developing system technical requirements and interface standards; developing or otherwise identifying and adopting existing standards and guidelines for system operations, customer relations, fiduciary process, mapping and the like; testing and evaluating system components and services provided by potential CSPs against these standards and guidelines, and certifying that service providers conform; and retesting and recertification on a regular or as-needed basis. This certification process may be performed by ODOT and/or other areas of Oregon state government, by independent certification entities under contract to ODOT, or CSPs may “self certify” for some RUC functions.

ODOT will also be responsible for managing all contracts and service level agreements (SLAs) with CSPs, certification entities, and with contractors that are used to outsource some of the ODOT functions (e.g., ODOT account management as the provider of last resort). While the long-term goal is for the CSPs to provide most, if not all, of the RUC functions with no compensation from ODOT, a contractual relationship will still be required to accommodate the transfer of RUC funds from CSPs to the Oregon State Treasury, and to permit auditing functions by the RUCA.

Another “contract management”- related activity involves **multijurisdictional agreements**. HB 2453B permits ODOT to enter into agreements with other state departments of transportation, the federal government and Canadian provinces for the purposes of conducting joint research relating to road usage charges and development programs on a multistate basis; furthering the development and operation of single state or multistate road usage charge pilot programs; and developing a program for stakeholder outreach and communications with respect to road usage charges.

5.2.5.2 Compliance and Enforcement

This is an ongoing system feature to ensure that all subject vehicles are included in the RUC system and that RUC payers within the state pay the correct RUC in a timely fashion. Minimizing evasion and nonpayment will involve three functions:

- **Education and Public Outreach** - Providing information to current and future users regarding the RUC system functions and operations (e.g., the necessity for the road usage charge, definitions of subject vehicles, per mile rates, choices for complying, frequently asked questions), and ongoing relationship management. This will help ensure that the public understands the problems addressed by the RUC system and how it works, thereby promoting transparency. It is envisioned that the public outreach activities will include on-line resources (e.g., RUC web page), printed materials (e.g., available at DMV offices and auto dealers), and press releases.
- **Audit/Reconciliation** - Providing a clear, traceable reporting structure to support audit activities, including (but not limited to) comparing road usage data with revenue collection and checking to ensure the system had correct vehicle data in the transaction, that the calculated charge was accurate, and that customer accounts were processed correctly. Multiple types of audits are envisioned—both internal and external to the organizations (e.g., ODOT, CSPs)—to ensure that

an entity would perform system services and make payments in accordance with established requirements and guidelines.

- **Enforcement Activities** – These direct activities include checking DMV registration information to identify the subject vehicles and whether the owners / lessees of these vehicles have set up a RUC account and are reporting mileage, and monitoring RUC payers for compliance, including charging fees and penalties for noncompliant behavior (e.g., tampering with the data collection function, false reporting).

5.2.5.3 Evaluation and System Update

This includes the development of system performance measures followed by an ongoing comparison of system operation to these performance metrics, including collected revenues relative to costs, revenue and cost trends and other operational factors, reliability of system hardware, customer program acceptance and response, and public attitudes. As a result of this evaluation function, the RUC system may be updated or otherwise modified.

5.3 Temporal Considerations

The RUC system will evolve over time. How it will look and operate at any time in the future will depend on a variety of factors, including (but not limited to) the number of subject vehicles in the system, the growth of other vehicle-related services (e.g., PAYD insurance, traveler information, concierge services) the growth of in-vehicle telematics, enhancements to vehicle and communications technologies and the associated standards, and the extent to which other states implement RUC systems and their compatibility with the Oregon RUC.

Per HB 2453B, the Oregon RUC will commence operation on July 1, 2015. Figure 16 shows the target configuration for the start of “Day 1” operations. In several respects, this target configuration is an expanded version of the RUCPP – at least one private entity (and preferably more) will provide account management activities, with one likely providing the ODOT account management functions on an outsourcing basis; basic, advanced, and switchable MRD’s will be available from multiple vendors; certification will primarily be an ODOT function in much the same way RUCPP testing occurred (unit testing, integration, and overall system acceptance testing); and RUC public outreach will continue.

The Day 1 configuration goes beyond the RUCPP in several areas, including the incorporation of vehicle telematics data into the system, MRDs that also provide other functions in addition to RUC, a more robust RUC accounting component (e.g., master set of accounts, liaison with DMV, using the registration information from DMV to identify mandatory subject vehicle types, auditing of CSPs), enhanced certification activities to include business processes and fiduciary practices, and enforcement activities (e.g., monitoring MRD removal, assessing fines and penalties). Auto dealers will also be involved in the RUC sign-up process, particularly for mandatory vehicles.

Over time, it is envisioned that the RUC system will grow into something like that shown in Figure 17. A key differentiating feature of this configuration is that the RUC has become a **multi-state system**, with a significant increase in the numbers of subject vehicles across all the involved states. This increase in subject vehicles is expected to promote even greater numbers of private CSPs (for account management, data collection, and mileage reporting) and enhanced value added services of which RUC will be an integrated part. Other distinguishing features for this future configuration include:

- Increased vehicle telematics for mileage reporting and data collection as that market grows and matures (and correspondingly, advanced offerings of value added services)

- Enhanced OBD-II standards including interfaces for all vehicle types (eliminating the need for reverse engineering the pin configurations for certain vehicles)
- Certification performed by private certification entities under contract to one or more states, with the involved RUC states having compatible (if not identical) standards and guidelines for RUC technologies and operations
- A regional clearinghouse that manages the master set of accounts and performs account reconciliation for the multiple states. This multi-state approach permits the RUC to be assessed in all states regardless of home state, including cross-charging between states (presumably at different state-specific, per mile rates).
- RUC system costs are reduced as a result of increased economies of scale

Figure 16
Target System Configuration for Day 1
Target System Configuration

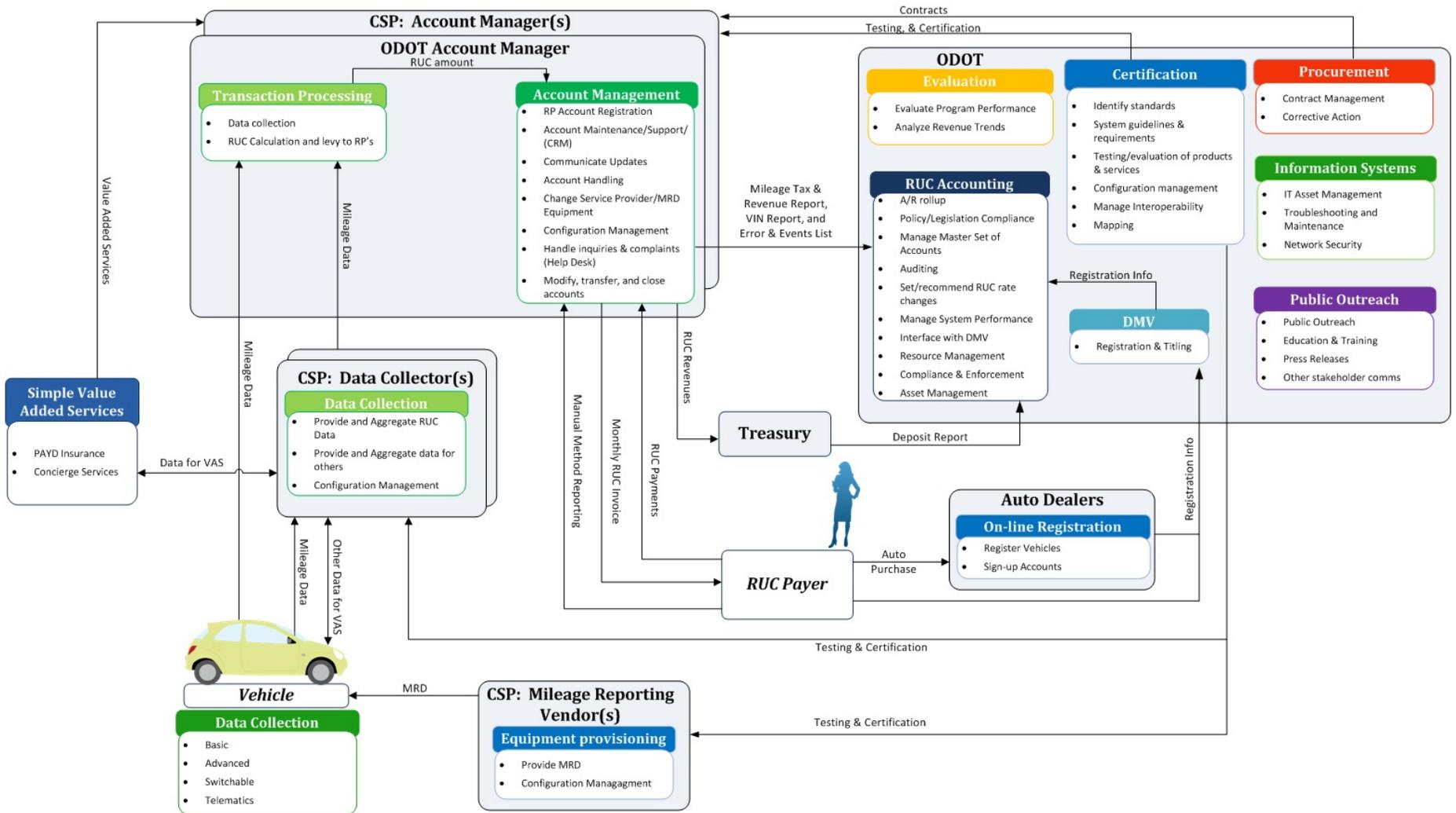
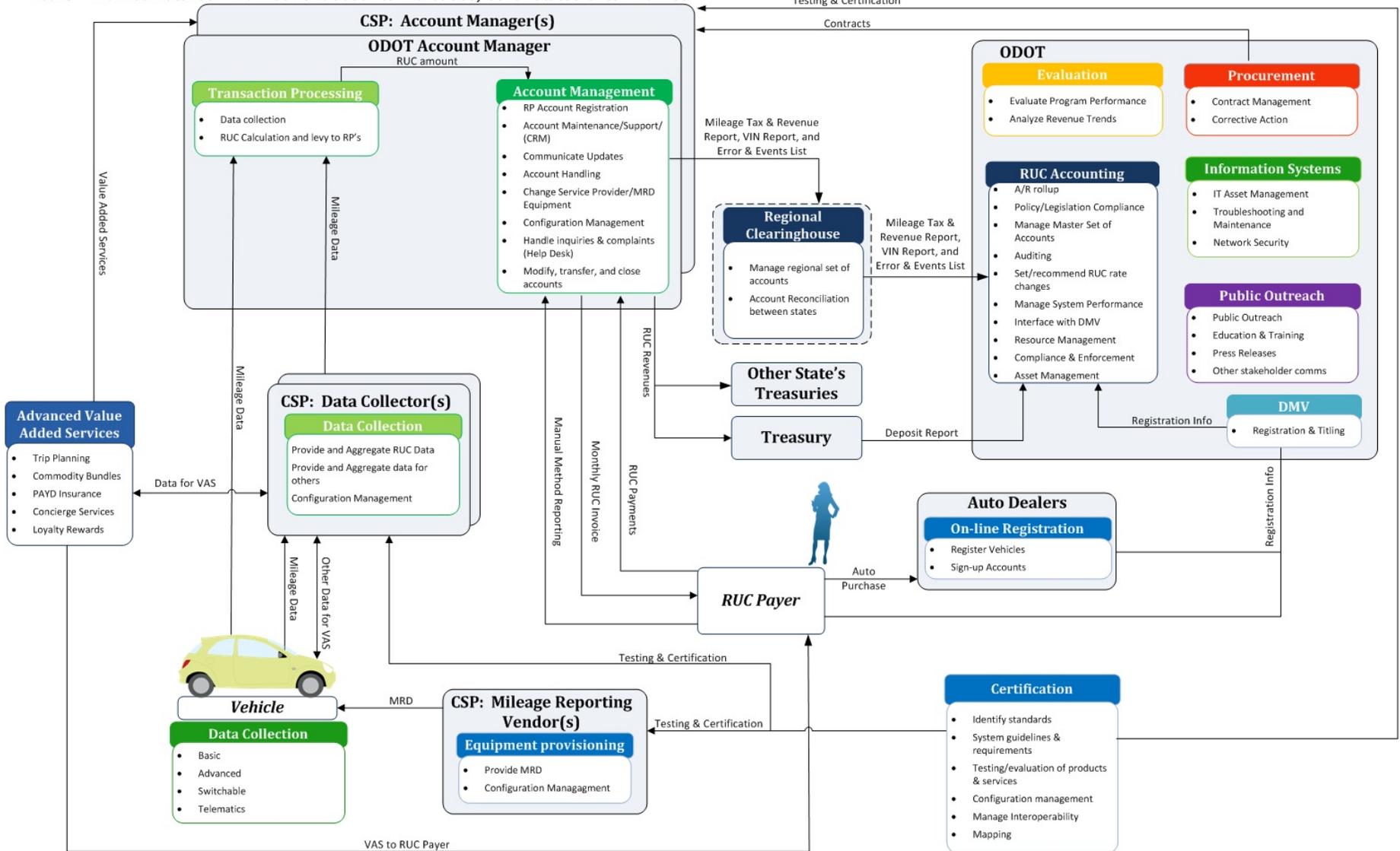


Figure 17
Ultimate System Configuration

Years – Market Matures – Number of accounts increases, other states enter market



6 Operational and Support Environment

This chapter provides additional details regarding the Oregon Road Usage Charge system concept, including the system architecture approach, MRD capabilities and functions, account management activities and the associated services, system compliance, privacy concerns, CSPs and the associated certification process, the role of ODOT and the associated organizational framework, and evaluation of system performance.

6.1 Open Architecture Concepts

The RUC system concept is based on maximizing the use of automated processes for all the activities and functions associated with the RUC, while simultaneously providing user choice and ease of use. These functions include:

- Measuring/reporting the chargeable miles driven and amount of fuel used (mileage collection)
- Applying RUC rates and calculating the charge, less any gas tax credits for fuel used (transaction processing)
- Providing RUC payers with invoices and accepting payment via a variety of means (account management)
- Keeping track of the vehicle makes, models, and years that are subject to the RUC, maintaining and updating a master set of accounts for the RUC system, and ensuring the proper amount of RUC revenues are transferred to the Oregon State Treasury (RUC accounting)
- Transferring information and data among subsystems and processes (communications)
- Ensuring that all the RUC components and processes conform to the appropriate technical standards and business process guidelines (certification)
- Supporting effective deterrents and actions against fraudulent actions and delinquents, and auditing and reconciling accounts (compliance)

While the RUC concept embraces technology to the greatest extent possible, it must not become dependent on a single technology or allow technology to overwhelm users. Moreover, in this age of technological revolution and constant improvement, the system must be flexible and open to accommodate new technologies that could emerge over the next few years. Finally, it should encourage open competition among private vendors who wish to support the RUC system in order to minimize costs (and increase net revenues).

In accordance with HB 2453B, the RUC system concept is based on the principles of an “open system”, which is defined in the legislation as *“an integrated system based on common standards and an operating system that has been made public so that components performing the same function can be readily substituted or provided by multiple providers.”* In other words, an open system architecture refers to a system with fully open interfaces and component specifications that promotes system interoperability and allows different members of private industry to participate in those parts of the program they are best suited to support. It also encourages open competition among vendors. Above all, open architecture prevents the deployment of proprietary interfaces resulting in vendor lock-in, a situation where the public agency is supported by only a single private vendor.

HB 2453B also requires ODOT to “adopt standards for open system technology”, and in doing so, to “collaborate with agencies of the executive department to integrate information systems currently in

use or planned for future use.” As discussed in Chapter 3, this process started in early 2012 with the development of a PSRS and a PICD for use in the initial RUCPP.

- The SRS defines what each of the RUC subsystems (i.e., mileage collection, road charge processing, RUC accounting) and related functions (as shown in previous Figure 15) should do and provide, while minimizing any statements or specifications as to how these functions must be accomplished, leaving such details and designs to the RUC vendors and CSPs.
- The ICD covers the interface and mileage messages between the mileage collection subsystem and the road charge processing subsystem, and the interface between the road charge processing subsystem and the RUCA subsystem. Having a standardized interface and message format is vital to operating open systems. It effectively decouples the MRD provider from the CSP, thereby helping to further promote a market for MRDs (in addition to PAYD insurance and other vehicle concierge services). As discussed in Chapter 3, the concept of an open RUC system was validated during the RUCPP, allowing MRDs from two different vendors to operate with another vendor’s road charge processing subsystem.

The SRS and ICD are in the process of being updated based on the lessons learned and evaluation results from the RUCPP. Key elements of the current versions of these documents are highlighted in subsequent sections herein. Moreover, other standards and guidelines are expected to be identified and adopted as part of the certification process. At the same time, the RUC standards must not be too detailed or rigid, thereby potentially reducing the number of certified RUC vendors, stifling any innovative approaches, and / or increasing system costs.

6.2 Mileage Reporting Device (MRD) and Vehicle Telematics

The MRD is the device and / or software application (e.g., in the case of in-vehicle telematics) that interfaces directly with the vehicle, collects and reports mileage and related data from the vehicle, processes and stores the information, and then transmits the data to the road charge processing System. As discussed in the previous chapter, three mileage reporting approaches are envisioned for the RUC system.

- **Undifferentiated Mileage** – This approach for measuring and reporting vehicle mileage involves a Basic MRD that obtains data from the OBD-II port to calculate the mileage, or reads the electronic odometer via the vehicle telematics capabilities. The Basic MRD possesses no location-determination electronics or capability, such as GPS, thereby satisfying the requirement in HB 2453B that ODOT “establish at least one method of collecting and reporting the number of miles traveled by a subject vehicle that does not use vehicle location technology”. A RUC payer choosing this “total mileage” approach will be charged for all miles the vehicle is driven—undifferentiated by geographic location—including any miles driven outside of the state.
- **Differentiated Mileage** – If RUC payers want to differentiate their mileage by geographic location, including out of state travel (for which the mileage is not chargeable), they can choose a location-based measuring and reporting approach. This approach includes an Advanced MRD and /or software (e.g., telematics) with location-determining technology. The Advanced MRD / telematics may also be capable of differentiating travel on private property.
- **Switchable** – This approach allows the RUC payer to switch between undifferentiated and differentiated mileage reporting depending on their circumstances. This approach uses a Basic MRD that can connect to a driver’s Smartphone (e.g., Android-based or iPhone) or a tablet computer via Bluetooth or other short-range wireless connection. When paired, the MRD uses

the GPS capability of the phone and a RUC “app” on the phone to differentiate the mileage. Another possible approach is an actual switch on the MRD itself that allows the driver to activate / deactivate the device’s GPS capability. Any switchable MRD must be capable of indicating to the driver which mode it is operating in at any time.

6.2.1 Plug-In MRD

The MRDs used for the RUCPP – and likely the primary approach for the next several years – are separate devices that plug into the vehicle’s self-diagnostic OBD-II port. OBD-II systems give the vehicle owner or repair technician access to “state of health” information for various vehicle subsystems. OBD-II was created by the state of California’s Air Resources Board as a way of requiring access to emissions-related data in vehicle electronics; as such, it focuses on emissions-related data. OBD-II was endorsed nearly unchanged by the EPA, making it a requirement on all U.S. vehicles beginning in 1996. It has been a requirement on most internationally built vehicles (in slightly modified formats) since about 2000.²²

There are several Society of Automotive Engineers standards that codify the way that OBD-II is implemented in U.S. vehicles. These OBD-II standards specify the type of diagnostic connector and its pin-out,²³ electrical signaling protocols available, and messaging format. It also provides a candidate list of vehicle parameters to monitor along with an explanation for how to encode the data for each.

6.2.1.1 Reading Vehicle Mileage

Both the Basic and Switchable MRDs must obtain mileage information via the OBD-II port; and even the Advanced MRD requires this same information if the location capability is used solely for differentiating mileage by in state / out of state (and possibly identifying when miles are driven on private property). While reading the vehicle’s electronic odometer would seem to be the most straightforward method for automatically obtaining mileage data from the vehicle, this mileage information is not one of the required outputs of the OBD-II, nor is it one of the standardized parameters.²⁴ (It is important to remember that the OBD-II standard (SAE J1979) was developed with emissions monitoring and related vehicle diagnostics in mind; not mileage-based charging). As was discovered during the RUCPP, there are other ways to accurately obtain mileage information via OBD-II, including:

- Combine the vehicle’s speed information (a standard parameter available from OBD-II) with a time measurement, sampling the information at an appropriate interval to estimate the mileage.
- OBD-II includes a value called “distance traveled since codes cleared,” which is available on many vehicles. The MRD may be able to maintain a counter of the miles traveled by regularly querying this value and then incrementing the counter when this data output is incremented. There are, however, two potential issues with this approach. One issue is that if the codes are not cleared for an extended period of time, the counter will max out (at 65,000 kilometers). Some manufacturers roll the counter over to zero and the counting resumes; but others simply leave

²² OBD-II is, in fact, a model for how a state agency-developed requirement can become an international standard and, as such, could be a model for this project.

²³ A “pin-out” is a cross-reference between the contacts, or pins, of an electrical connector or component and their respective functions.

²⁴ The controller area network (CAN) bus is the primary connection between all vehicle electronics units and contains most important data on a vehicle, including the odometer reading. However, the CAN bus cannot be readily considered for the Oregon Vehicle Mileage Tax System because, while the CAN bus communications standards are open, the actual CAN bus messages are proprietary to each vehicle manufacturer. This would require a specific OBU for each vehicle type and manufacturer.

the counter at the max value and the counting stops, at which point any MRD plugged into the vehicle would cease to record miles correctly. A second issue is if the MRD is disconnected from the vehicle (either intentionally, or by accident) for any significant period of time and the codes are reset (either through a service visit, or by the battery being disconnected) prior to the MRD being reconnected to the vehicle, all the miles travelled during the time the MRD is disconnected will be lost²⁵.

Another OBD-II issue concerns EVs, PHEVs, and HEVs (the most likely type of mandatory vehicles during the initial years of the RUC system). While the standard is mandatory across vehicles whose motive power is solely the internal combustion engine, not all HEVs fully comply; and there is no legal requirement for EVs to comply with the standard (because EVs have no emissions). The process for integrating mileage reporting technology with such vehicles that do not adhere to the OBD-II standards involves scanning the vehicles OBD-II interface for all exposed parameter IDs (PIDs) and reverse engineering the results to try and infer the pertinent parameters. The number of PIDs exposed by a vehicle can run into the tens of thousands. In addition to the PIDs required to determine mileage and fuel consumption, other PIDs are required to ensure the safe operation of the device. The exposed PIDs vary greatly between vehicle manufacturers, models and often different versions of the same model, so it is necessary to treat each make and model on a case by case basis. As was discovered during the RUCPP, for one HEV, the PIDs change parameters depending on whether the vehicle is running on electric power or using the ICE. That said, the telematics industry is experienced in performing this reverse engineering effort. Accordingly, obtaining the necessary information for HEVs and EVs is not an insurmountable problem; but the process to decode a specific vehicle make and model, make the required custom changes to the mileage reporting device firmware, and then perform the necessary testing and quality control processes is a lengthy one – a situation that can increase system development and implementation costs.

6.2.1.2 Estimating Fuel Use for RUC Credits

HB 2453B provides that payers of the Road Usage Charge who have paid the Oregon fuel tax may be reimbursed the amount of the fuel tax paid or be granted a credit against future Road Usage Charges. The RUCPP addressed this in two ways:

- In vehicles that exposed mass-air-flow sensor values (or equivalent) over the OBD-II interface²⁶, the MRD collected and accumulated the necessary PIDs along with the known fuel and vehicle information to estimate total fuel consumption. This information was then used to automatically calculate the amount of the fuel tax paid (pro-rated when mileage was differentiated) and include as a credit on the invoice. This provided a reasonable estimate of fuel use.
- For those vehicles where this information was not available, the fuel used was estimated by dividing the chargeable miles driven (as measured by the MRD) by the published EPA estimates of the average combined city – highway MPG for the specific vehicle make, model, and year.

6.2.2 Vehicle Telematics

Even with all the potential issues concerning an external MRD plugged into the OBD-II, the RUCPP demonstrated that this is a viable solution for moving forward with the RUC. Moreover, the insurance industry is developing similar plug-in devices for pay-as-you-drive insurance, and vehicle concierge

²⁵ As the system will “know” when the MRD is disconnected, any such “lost mileage” may be recovered based on past history or by manual reporting.

²⁶ Fuel use is not a standard OBD-II output

services are developing and utilizing similar devices. (Because there is only a single OBD-II port, it will be important for the development of MRD's for RUC to be coordinated with these other vehicle services such that a single MRD provides multiple functions including RUC data collection.)

The long term vision for the RUC is that ultimately, there will be no need for an external plug-in MRD. The data and other information required for road usage charging (and for other vehicle-related services) will be provided directly via the vehicle's telematics (Figure 18). Examples of such factory-installed telematics include GM's OnStar, Ford's Sync, Mercedes' Embrace, or Toyota's Entune. These already provide a number of services to drivers and passengers, including hands free calling, navigation (including turn-by-turn driving instructions and traffic alerts), business search (i.e., "yellow page") functions, entertainment (e.g., voice activated music search, radio tuning, and audio books), vehicle diagnostics and health reports, and emergency and security services (e.g., automatic crash response, roadside assistance, and stolen vehicle assistance). RUC data collection and account management can become a value added "app" to these existing services.

Figure 18
Example of Vehicle Telematics



Significant growth is anticipated in the telematics market. The convergence of computers, telecommunications, data analytics and automobiles is responsible for a telematics industry that is predicted to grow from 10.2 percent in 2012 to 49 percent by 2017. Another market report indicates that by 2017, 80 percent of all EVs – all of which are mandated subject vehicles – will come with advanced telematics systems installed. Car manufacturers, insurance companies, telematics service providers and wireless carriers are also entering into joint ventures to provide this service.

6.2.3 Location-based Differentiation and Reporting

The Advanced MRD concept uses vehicle location technology to determine where the vehicle is being driven to differentiate the mileage and the subsequent road usage charge (i.e., in state mileage on public roads is chargeable; mileage driven out of state or on private property within Oregon is not chargeable). Another Advanced approach is to use the location capability of the MRD to directly measure the mileage driven (i.e., not use mileage derived from the OBD-II port)²⁷ while still

²⁷ This approach was generally not used in the RUCPP, except to identify small segments of missing mileage.

differentiating this mileage by location (although this can be problematic in areas of the state where GPS coverage is spotty).

There are several options for measuring miles traveled using the vehicle's location on a continuing basis and calculating the distance between observed locations:

- **Global positioning system** – GPS receivers provide a vehicle's location by triangulation from signals received from the NAVSTAR GPS satellite system (typically, accurate readings require signals from four or more geosynchronous satellites).
- **GPS with digital mapping** – Incorporating digital mapping into a GPS system provides the potential for additional accuracy (and future application of different charging parameters). Digital maps are downloaded periodically and stored in the MRD or an external data collection process. The maps may then be used to match the vehicle's location to facilities on the map. This improves locational accuracy and distances calculated from the points along the route. Major issues associated with digital maps include distribution and maintenance; communication between the vehicle and the map issuers must occur on a regular basis.
- **GPS location from another device** – Location information is obtained using a third-party device such as a Smartphone (with GPS) paired to a Basic MRD via Bluetooth. This is a "switchable" MRD approach.
- **Cell phone/broadband triangulation** – This technology, also termed wireless location technology (WLT), takes advantage of the fact that cell phones, once turned on, passively seek out the closest carrier towers to prepare for the possibility of a call. This passive signaling activity occurs in the background as long as the phone is turned on. As drivers with phones move down the road, they cross cell boundaries while maintaining contact with other towers and creating additional useable signaling. A phone's latitude/longitude coordinate locations can be tracked to provide a measurement of the distance traveled by coupling the relative signal strength and time offset of a cell phone's received radio signal at multiple cellular towers (in other words, triangulation) with mapping data. With this approach, the MRD would be equipped with broadband technology similar to that used in cell phones.

It is emphasized that, in accordance with the concepts of an "open system," none of these (or other) methods will be required. It is up to the MRD providers to select an approach that meets the minimum requirements for location accuracy. The mapping used and its accuracy will also be important considerations as well. Accurate mapping will be necessary to identify (for any RUC approach that differentiates mileage) state lines and public roads. The frequency of updating the mapping to reflect any new roads or changes in public and private property will also be an important consideration. As is the case with the location technology, no specific map database will be provided or specified by ODOT.

6.2.4 MRD Processing and Communications

The MRD – whether a plug-in device or part of vehicle telematics – needs to have some degree of processing and storage capability to take vehicle (and perhaps location) information and convert these data into the required RUC system mileage message format for transmission to the transaction processing function. This information includes the following (not a complete list):

- Vehicle Identification Number (VIN)
- MRD identification number (including issuer and type and software version)
- Date/time of transmission

- Chargeable miles by day (as previously discussed, the value of the chargeable daily miles would depend on whether the vehicle was driven out of state or on private roads, provided the mileage collected is differentiated by location)
- Total miles by day (if mileage is undifferentiated [Basic OBU], this value would be the same as the “chargeable miles by day” value)
- Fuel usage by day
- Miles traveled by zone (a potential future feature that might be used should different rates be established for different areas)
- Error and event codes (e.g., low voltage, MRD disconnects / reconnects to the OBD-II [also including time of disconnect and reconnect, and data on miles while disconnected if available]), connected to a new vehicle, location data degraded (advanced only), missed or degraded mileage, communications failure, anomalies in monitored vehicle functions and parameters (e.g., check engine light) that could compromise the collection and reporting of RUC data)

Reporting the mileage by day allows the account management processing activities to sort out who should be charged “after the fact;” an important consideration when the vehicle is sold and the title transferred. It also is useful for the RUC Accounting and auditing functions.

The mileage message (as defined in the ICD) contains the same data elements and formats for both the Basic and Advanced MRD, with some fields being blank depending on the MRD and/or vehicle type. It is important to have identical transaction records and data domains throughout the RUC system to minimize the costs of hardware and system operations.

The ICD also embraces a “cloud-based” approach to communications from the MRD. A cloud computing solution takes advantage of an emerging marketplace trend and creates a system that is communications technology-independent. As long as the internet is operational, the system will be able to continue functioning seamlessly, regardless of changes in communications technology.

6.2.5 Other MRD Design Features

Other MRD design features have been, or will be (based on the RUCPP experience) incorporated into the RUC system requirements and ICD. These will also apply to vehicle telematics, and will include:

- Transmitting a mileage message each day, even if the vehicle has not been driven that day. This provides an indication that the MRD is still connected and operating properly, even though the mileage message for the day will indicate zero mileage. The lack of this daily mileage message could indicate a faulty MRD (and missing mileage) or that the MRD has become disconnected from the OBD-II port (either accidentally or due to some sort of attempted evasion).
- Indications that the MRD is operating properly, needs maintenance, is switched to an “Advanced” mode or other location reporting device.
- Measures for detecting potential tampering or fraud, such as the ability of the MRD to record if and when it is disconnected from and reconnected to the OBD-II port, and when it is installed in a new vehicle.
- Accuracy of mileage traveled measurements (maximum error of +/- 5%).
- Accuracy of fuel usage measurement (maximum error of +/- 5%).
- Accuracy of vehicle location.

Finally, it is emphasized that ODOT will have minimal involvement, if any, in manufacturing MRDs, installing them in vehicles, or maintaining them, other than to develop standards and specifications

under an open system architecture. MRDs will be managed—as would any other device contained in a motor vehicle—as a private sector responsibility.

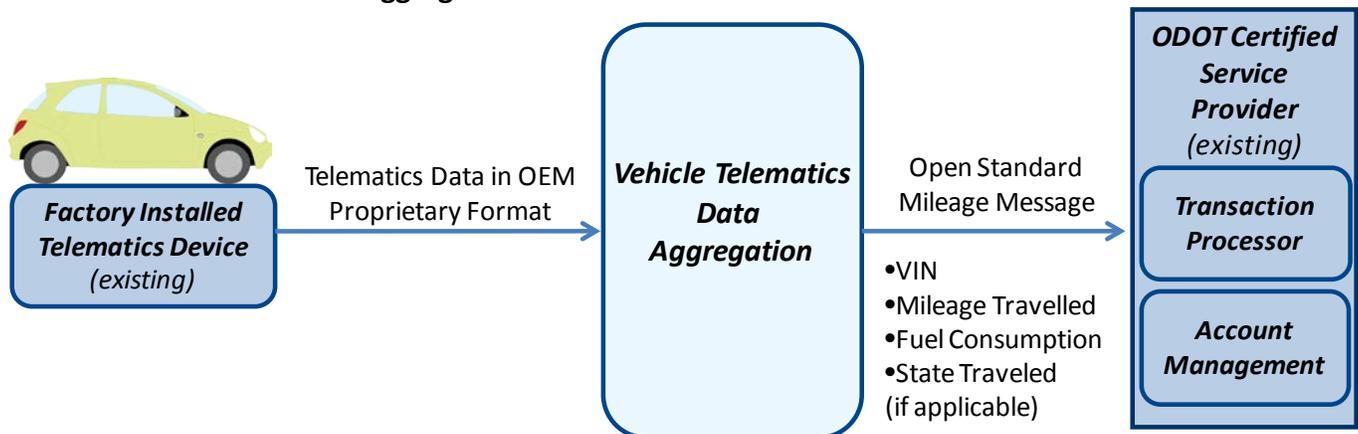
6.2.6 Data Collection

MRD vendors must provide a data collection component or arrange with another selected vendor to provide the data collection functions. The data collection component may reside in the vehicle (i.e., be integrated within the MRD / vehicle telematics), transmitting the standard mileage message to the road charge processing subsystem directly from the vehicle. Alternatively, the data collection component may reside in an external location, such as a data collector’s or account manager’s facility.

The Data Collection component receives the information collected by the MRD, stores the data, converts the information into the standard format mileage message (as part of an open system), and transmits this standard message to the road charge processing subsystem.

Another potential function of the data collection component is that of “**data aggregation.**” As shown in Figure 19, a “data aggregator” would provide the data collection functions as an independent (and certified) service provider between the vehicle telematics (and possibly MRDs) and the road charge processing subsystem. The telematics data aggregator collects telematics information from vehicles in the OEM’s particular proprietary message format and the OEM’s communications infrastructure. The data aggregator would then parse the particular vehicle’s VIN, mileage travelled (with data and time stamp), fuel consumption, and state traveled (if applicable), and then route that information to an account management CSP using the open standards messaging format as defined by ODOT.

Figure 19
In-Vehicle Telematics Data Aggregation



6.2.7 Manual Mileage Reporting and Other Fallback Options

As was learned during the RUCPP, a few owners / lessees of mandated subject vehicles who desire to use a technology solution to automatically measure and report their miles may not be able to use the available technology due to a variety of reasons – for example, the OBD-II port may be damaged (i.e., cannot securely hold the MRD and / or provide the required data), the OBD-II port may be located such that an installed MRD interferes with safe driving, the subject vehicle may not conform to the OBD-II standard and the necessary reverse engineering has not yet been performed to identify the data associated with each pin in the port, or the vehicle simply may not have an OBD-II port and vehicle telematics is not an option. Under such circumstances, the RUC payer should not be required to pay the Flat Annual RUC as their only remaining option. Accordingly, these RUC payers must be provided with fallback options for reporting their mileage. Possibilities in this regard will likely include:

- Permanently installed GPS device with the VIN and other pertinent information hard coded into the device (i.e., no connection to the OBD-II is necessary). The GPS capability is used to measure and differentiate mileage. Another option in this regard is for the RUC payer to purchase and install an after-market service such as On-Star or Sync, provided it is available for their vehicle and provides RUC function.
- Manual mileage reporting where the RUC payer pre-pays based on estimated annual miles. This fallback method requires a verifiable odometer reading and a periodic “truing up” of the RUC based on actual odometer data. The odometer reading process and associated activities are summarized in Table 4.

Table 4**Manual Mileage Reporting Process**

- **Determination that technology-based mileage reporting option is not feasible for subject vehicle.** In addition to maintaining and updating the list of mandatory subject vehicles, the RUCA (described in greater detail in a subsequent section) will also identify which of these subject vehicles will likely not be compatible with any of the available technology-based choices.
 - Other non-compatible vehicles (i.e., faulty OBD-II port) will be identified during the registration / RUC choice / initial MRD installation process). These RUC payers will be given the option of having the OBD-II repaired / replaced, or to adopt the manual mileage reporting method.
- **RUC sign up.** RUCA will send program registration information to subject vehicle owners / lessees who are eligible for the manual method. RUC payer has 30 days from title to register for RUC.
 - RUCA obtains initial odometer reading from new title filed with DMV.
- **Initial manual RUC assessment.** RUC charge is based on estimated mileage for the upcoming year, followed by prepayment.
 - No differentiation provided for miles driven out of state
 - Fuel tax credit calculated based on average annual mileage and EPA rating – For example, if the fleet average annual mileage = 15,000, rate = 1.55 cents per mile, then annual RUC due at registration = \$232.50 (before gas tax credit). The average annual mileage could be set or adjusted each year based on DMV fleet data.
- **Collection of manual RUC.** Invoice sent through U.S. mail or electronically, depending on payment method choice. Payment can be made on a website.
 - Quarterly payments are allowed as an option to an annual prepayment
 - Automatic credit/debit card payment provided (service fees may be charged)
 - Additional payments can be made at any time to allow RUC payers to pay additional anticipated mileage above the annual estimate
- **Periodic odometer readings.** A minimum of one odometer reading per year is required.
 - Annual reading required within 6 months prior to the RUC program registration anniversary date
 - Verification of odometer reading and date may be provided by an auto service entity directly to RUCA, or RUC payer may provide service invoice with date, odometer reading, and VIN to the RUCA
 - Odometer readings may also be provided by state entities located around the state (e.g., DMV) for a possible fee
 - Multiple odometer readings per year permitted
- **RUC account true up.** Annual adjustment based on actual annualized odometer readings, less any credits for travel on private roads.
 - Per HB 2453B, RUC payers may apply to ODOT for a refund for metered use of a road, thoroughfare or

property in private ownership. An application for a refund must be submitted to ODOT (RUCA) within 15 months after the date on which the per-mile RUC claimed is paid. The application shall be in a form prescribed by ODOT by rule and must include a signed statement by the applicant indicating the number of miles for which the refund is claimed.

- RUC payment for the upcoming year is estimated based on historical odometer readings.

- **Account Closure, Overpayment and Underpayment**

- RUC payer notifies RUCA to close account, and the reason for account close out (e.g., sale of vehicle, moving out of state, technology-based solution now available)
- RUCA performs final account true up to determine actual mileage unpaid or refund owed. (If title change, the odometer reading on title form is used)
- RUCA sends a bill or notice of refund

It is emphasized that these mileage reporting options are **not a choice**; but rather a fallback condition whenever a RUC payer desires to use an automated approach, but the chosen technology is not compatible or possible with the individual's vehicle. The number of vehicles that will need to use the manual mileage approach will likely be relatively small²⁸; and as vehicle telematics become more widespread, or should the automotive industry release more information regarding their specific OBD-II PIDs, the number of subject vehicles requiring a fallback option may further decrease. Moreover, manual mileage reporting will never be applied to RUC payers who have chosen a technology-based mileage reporting solution that is compatible with their subject vehicle.

6.3 Road Charge Processing and Account Management Operations

The account management entities – including private sector CSPs, and ODOT (for those RUC payers who prefer the government to manage their RUC or who otherwise can't qualify with a CSP) – perform all of the functions necessary to account for RUC payers and their applicable charges and to facilitate funds transfers among participating parties. They handle these major functions:

- Account registration and set up (with each account corresponding to a specific vehicle and MRD).
- Account maintenance and support.
- Vehicle data collection and transaction processing.
- Charging miles to that account while also accommodating any credits for fuel taxes paid as well as travel out-of-state or on private property.
- Preparing and sending out RUC invoices to RUC payers.
- Receipt of RUC payments via a variety of payment types (e.g., credit and debit cards, electronic transfers).
- Managing accounts receivables.
- Reconciliation and audit of road usage data and revenue collection and distribution.
- Collecting overdue charges, penalties and fines
- Transferring collected RUC payments to Oregon Department of Treasury on a periodic basis

²⁸ In all likelihood, volunteer subject vehicles will not be eligible to use the manual mileage reporting method, just as they will not be eligible for the High Flat Annual RUC per HB 2453B)

- Customer Relationship Management (CRM) such as web-based interface for RUC payers to query and check the status of their respective accounts, Help Desk operations, and other means for disseminating information to current and future customers.
- Modifying and closing out accounts
- Financial data processing and transfer of summary mileage and RUC payment information to the RUCA on a periodic basis. Examples of these reports include RUC Revenue, VIN Summary Report, and Error Event Report.
- Configuration management

CSPs will operate their own transaction processing and account management functions, interfacing with the ODOT RUCA using standard protocols. The risk of handling and receipt of payments will be the responsibility of the CSPs, as will debt collection. (Thus, the need for ODOT to offer and perform transaction processing and account management functions as the provider of last resort for those RUC payers who cannot qualify for a third-party account or who do not want a private CSP handling their account due to concerns with vehicle location data, allowable payment methods, cost of value-added services, and so forth.)

6.3.1 Transaction Processing

Transaction processing is an automated function, with activities that include calculation of the road usage charge for the chargeable miles driven using a rate table.²⁹ Data validation also occurs as part of transaction processing – for example, the MRD ID and the VIN match, mileage messages are complete, the date / time and accumulated miles are incrementing logically, and no error codes exist that might indicate missing mileage.

Transaction processing also calculates and generates the fuel tax credit based on:

- The estimated fuel consumption as provide by the MRD, or (if fuel consumption is not directly reported for a given vehicle).
- The number of chargeable miles traveled, using the EPA average fuel mileage for the specific vehicle (make/model/year/engine).

The mileage and RUC data are then sent to the account management component.

A transaction processing and account management issue still to be resolved is how to handle any missing mileage. If a frequent occurrence, it may be an indication of a faulty MRD (and / or OBD-II port) or even possibly fraud. If missing mileage occurs intermittently, it may be possible to extrapolate the missing amount based on historical mileage data or, if an Advanced MRD is used, based on location information from the data collector.

6.3.2 RUC Invoice and Payment

As a minimum, RUC invoices shall include the following information:

- RUC payer name and address
- MRD ID (if applicable)
- Total miles traveled

²⁹ For the initial RUC implementation, the rate table will be a single entry – 1.55 cents per mile. In the future, however, different states (or zones) may have different per mile rates.

- Chargeable miles traveled³⁰
- Fuel tax credit
- RUC amount owed

It is envisioned the RUC payment methods will include credit and debit cards, electronic transfers, and check, with the ODOT Account Management function also providing for cash payment. A key issue still to be resolved is the billing period. HB 2453B stipulates that ODOT shall establish by rule the reporting periods for the RUC, and that the reporting periods may vary according to the facts and circumstances applicable to classes of registered owners, lessees and subject vehicles. In establishing the reporting periods, the following factors are to be considered:

- The effort required by the registered owner or lessee to report miles traveled and to pay the vehicle road usage charge
- The amount of the vehicle road usage charge owed
- The cost to the registered owner or lessee of reporting miles traveled and of paying the vehicle road usage charge
- The administrative cost to the state

The RUCPP utilized a monthly reporting period (first of the month to the end of the month), with invoices sent out on the 5th of each month.

6.3.3 RUC Payer Services

Account management also includes several services and activities related to customer relationship management, including:

- Providing information regarding choices, potential value-added features, and procedures
- A web-based interface for RUC payers to query and check the status of their accounts
- Claims management, including incorrect payment and enforcement claims as well as manual refunds/credits for travel on private property and fuel taxes (as permitted by HB 2453B)
- Notification to customers when a mileage message is received indicating a condition that requires action by the RUC payer (e.g., errors, disconnects, MRD-VIN mismatch)
- Other services such as providing online and telephone (e.g., "Help Desk") access for RUC payers to ask questions and retrieve information (e.g., rates, how to comply, MRD distribution network, frequently asked questions, online registration, information about account status, complaints and problems with the account and / or MRD)

Another service involves the processes and interaction between CSP account managers when RUC payers wish to change their account (moving from one to CSP to another CSP) and / or change their mileage reporting approach. A key issue under such a scenario is that no mileage (and associated revenue) be lost during the transfer, opening, and closing of the account. Similarly, the changed and updated information must be included in the RUCA master set of accounts.

The account management component should have high availability (e.g., maintenance outages no more than 3 hours per week.) Moreover, the RUC account management component will be required to

³⁰ For the initial implementation, the chargeable miles will be those miles driven in Oregon on public roads, assuming the RUC payer has chosen an advanced or switchable MRD. In the future, chargeable miles may be broken out by State (for those states participating in a regional RUC system. If a basic MRD is used, the chargeable miles will be the same as the total miles.

maintain a duplicate (“backup”) copy of the database at a separate physical location, and to update the database in real-time when each transaction/change is recorded in the “primary” database.

HB2453B addresses refunds of overpaid RUC, requiring ODOT to provide processes and forms for RUC payers to apply for and receive overpaid RUC. ODOT may provide by rule that such refunds will be credited to future charges.

6.4 RUC Accounting (RUCA)

The RUCA function – to be housed within ODOT – provides methods for auditing and verifying CSP compliance, and assuring ODOT and the Oregon Treasury that the RUC system is performing all necessary functions and that all appropriate RUC revenues are being collected in a timely manner. In essence, the RUCA manages the overall road usage charging program.

Functions of the RUCA may include the following:

- Implement a method for identifying those vehicles that are “mandatory subject vehicles” per HB 2453B (i.e., 2015 model year vehicles (and beyond) that are rated at 55 MPG / 55 MPGe or greater. This methodology will likely be based on make, model, year, and engine type, using the EPA average fuel economy ratings to determine the MPG or MPGe.³¹ Similarly, the RUCA may also be responsible for identifying which of these subject vehicles may not be compatible with the available MRD or telematics technologies, and therefore eligible for the manual mileage reporting method as a fall back option.
- Determine the vehicles in Oregon that are currently subject to the RUC based on data from DMV. (Note – The DMV database includes the following information in this regard: VIN, Body Style, Brand Info, Customer Number, Exempt Codes (Government, permanent registration, etc.), Flag Notations (sold, wrecked, etc.), Legal Owner Customer Number (lien holder), Legal Owner/Address (lien holder), Odometer Info at title transfer (for 10 yrs and newer), Plate Number, Registered owner/address, Registration expiration date, Title Number, Vehicle year, make and model, and VIN). This information will be provided to RUCA by DMV and updated on a periodic basis.
- Confirm that all subject vehicles and the associated VINs are included in the RUC program and assigned to an account management CSP (or ODOT CSP), providing a list of VINs to DMV of subject vehicles and the associated owner / lessee that are not registered with an account management CSP.
- Notify the owners / lessees of subject vehicles of the RUC requirements and compliance enforcement.
- Maintain the RUC mileage rate tables and making recommendations for changes to RUFTF.
- Oversee the certification of CSPs (discussed later in this section).
- Perform periodic audits and other enforcement-related activities (discussed later in this section)
- Produce reports confirming the accurate collection, processing, and transference of RUC revenues to the Oregon Treasury and RUC statistics to the RUCA.
- Confirm the proper collection and allocation of RUC revenues.
- Maintain the RUC master set of accounts

- Develop RUC performance measures, evaluate the RUC system, and identify improvements (discussed later in this section).
- Develop a variety of management reports on the results of the RUC program (e.g., operational traffic and revenue statistical results; data for a quarterly, semiannual or annual performance reports for the RUFTF and Oregon Legislature). Information for these reports will come from account management and other CSPs.
- Develop, in concert with RUFTF, business and other required RUC rules.
- Verify the RUC system is in compliance with Oregon Statutory language and adopted policy guidance.

Related “accounting” functions include configuration and asset management. This includes maintenance of a current list of all certified hardware and service providers and their offerings, analysis of potential systemwide impacts resulting from a proposed change in the system functionality, and tracking of these system and function changes.

6.5 System Compliance

An important question – what would motivate an owner or lessee of a subject vehicle to set up a RUC account, install an MRD, and then pay the mileage-based RUC without a direct and immediate consequence for such evasion and nonpayment? Perhaps most citizens would oblige in a spirit of fairness; it would be reasonable to expect them to pay their appropriate share of the costs for operating and maintaining the roadway network on which they drive. That said, the RUC system concept must assume that a certain percentage of motorists (presumably a very small percentage) would not set up an account or install the MRD, or otherwise pay the RUC.

If faced with a significant evasion problem, ODOT would have three options: receive less revenue, shift the evaders’ revenue burden to payers (e.g., raise the per mile rates), and/or engage in expensive and extensive civil collection actions to recover evaded mileage taxes. All three options seem unpalatable. A compliance effort is, therefore, of great importance to the success of the RUC system, and would likely consist of three activities: education, enforcement, and auditing.

6.5.1 Education

Taking the first critical step to achieving public acceptance requires making certain the public understands the problem addressed by the RUC. The public will never accept a solution to a problem they do not perceive, in this case, the eventual failure of the fuel tax. The education of owners and drivers of subject vehicles (and other vehicle types) about the system and why it is being implemented is just beginning (as part of this project’s communications effort). Education should be an ongoing process, with particular emphasis at the point of vehicle purchase or transfer that also addresses:

- Privacy/confidentiality
- Confidence in system vis-à-vis efficiency, technology, and automation (minimizing perceptions of a large and costly government bureaucracy)
- Funding stability, including that this is not a new tax, but a replacement of the state fuel tax
- Fairness and equity
- Transparency – how RUC rates were developed
- The need to create a positive association with mileage-based road usage charging in order to engender the notion that it is the smart choice for the next generation

The RUC education and public outreach / communications program will include several methods, including a website (including FAQs), brochures, press releases, videos, and focus groups.

6.5.2 Enforcement

As noted above, some sort of enforcement mechanism will be necessary to help minimize evasion and less-than-required payments of the road usage charges. It is important that the RUC system make evasion and avoidance difficult. The RUC system must assure accurate data generation and transfer as well as appropriate civil and/or criminal penalties for RUC evaders in order to ensure a high level of compliancy. At the same time, the cost of the enforcement processes **must** be significantly less than any additional revenues (i.e., charges and fines) collected as part of the enforcement process.

Some of the provisions in HB 2453B deal with enforcement; for example, a person commits the offense of tampering with the “vehicle metering system if the person³²:

- With the intent to defraud, operates a subject vehicle on a highway knowing that the MRD is disconnected or nonfunctional
- Replaces, disconnects or resets the MRD with the intent to reduce the number of miles reported.

Such tampering is a Class A traffic violation per HB 2453B.

The MRD requirements have been updated to address potential tampering activities. Compliant MRDs will be able to identify several conditions and scenarios that might indicate tampering (although in most cases, it will simply be an inadvertent action or an MRD malfunction; also important things to know). For example:

- Transmitting a positive notification (i.e., “heartbeat”) each day. On those days that a vehicle is not driven, this provides an indication that the MRD is still connected and operating properly, even though a mileage message for the day will not be sent. The lack of this daily heartbeat or a mileage message could indicate a faulty MRD (and missing mileage) or some sort of attempted evasion.
- Ability of the MRD to record if and when it is disconnected from and reconnected to the OBD-II port. This may indicate a faulty OBD-II port connection, or if the MRD is disconnected for a significant period of time, that the MRD has been removed, perhaps accidentally or perhaps on purpose, resulting in missing miles. The MRD requirements also include data on such missing miles if available.
- Other error and event codes (e.g., low voltage, connected to a new vehicle, location data degraded [Advanced MRD only], communications failure, anomalies in monitored vehicle functions and parameters (e.g., check engine light) that could compromise the collection and reporting of RUC data).

The enforcement program should include software (i.e., algorithms and logic) that can analyze these MRD-reported events and other related information over time (e.g., recurring and persistent events for individual accounts) to identify and flag potential tampering / evasion activities by RUC payers. Follow up investigations can then be conducted, including obtaining additional information from the RUC payer, to verify whether these series of events do, indeed, constitute legal tampering. An appeal process will also be required.

HB 2453B requires ODOT to “provide by rule for the collection of the road usage charges, including penalties and interest imposed on delinquent charges. Another possibility to promote compliance may

³² This does not apply to a person who is servicing, repairing or replacing a vehicle metering system.

be to have DMV put a lien on any subject vehicle that is delinquent or otherwise in violation of the RUC rules or statutes, thereby preventing any change in title until the violations are corrected.

Another likely enforcement function will be to monitor websites that provide advice and guidance for avoiding the RUC, and update the RUC system appropriately. (As an example, there are several sites that sell software and hardware tools for changing a vehicle's odometer. The euphemism used for these tools is "odometer correction", with the caveat that the tools are not to be used in violation of federal laws.)

6.5.3 Audits

The Merriam-Webster free dictionary defines an "audit" as a "formal examination of an organization's or individual's accounts or financial situation." For example, the Audit Section of ODOT's Motor Carrier Transportation Division is responsible for checking that all trucking companies operating in Oregon are in compliance with weight-mile tax reporting and Oregon registration requirements. RUC-related audits will also be conducted as part of the overall compliance program.

The RUCA will perform periodic audits of CSP³³ "performance" – audits that are designed to "...trust, but verify..." The potential list of RUC activities and processes to be verified through these periodic audits is extensive, including (but not limited to), verifying that:

- All subject vehicles are included in the RUC system with accounts set up and linked to the vehicle VIN.
- Mileage and other RUC data reported by the various mileage collection subsystems (MRD and data collection functions) is being accurately received and processed by the various road charge processing subsystems (transaction processing and account management functions) within the RUC program. This also includes confirmation that all RUC payer accounts are receiving mileage message data (and if not, why).
- The proper rate charging table and fuel taxes are being used for RUC calculations and fuel tax credits, and that the transactions and RUC charges and credits are properly posted to the correct RUC payer's account.
- VIN changes are properly coded and reported (additions and deletions/close outs).
- Historical transaction statistics are being maintained, and monthly reports (e.g., VIN Report) being sent to RUCA; and that the reports are reconciled with one another.
- All RUC revenues owed by the account management CSPs are being transferred to the ODOT Treasury on a periodic basis.

Agreements between ODOT and the CSPs will allow RUCA auditors to have access to road usage charge processing subsystems and records for audit. The agreements will also include business rules regarding the audit process, recordkeeping requirements (and the extent to which electronic records generated from the MRDs and other on-board devices may be used in this regard, and how long these records may be kept)³⁴, and processes for requesting a reassessment if the CSP disagrees with the audit results.

Audits of individual RUC payers may also occur, including:

- Audits based on indications of fraud such as recurring MRD disconnects and/or other MRD data that indicates potential tampering

³³ This also includes audits of ODOT account management activities as well

³⁴ More information on this is provided in the subsequent section on Privacy

- Audits to review refund applications and the associated records / invoices for travel on private property. HB 2453B states that the ODOT “may investigate a refund application ... and gather and compile such information related to the application as the department considers necessary to safeguard the state and prevent fraudulent practices in connection with tax refunds and tax evasion.” The proposed legislation also states that a person may not intentionally make a false statement related to payment and reporting of vehicle road usage charge or for collecting, attempting to collect, or receiving a refund to which a person is not entitled.
- Annual “true up” audits of mileage for those RUC payers enrolled in the fallback manual mileage method (as previously discussed in Section 6.2.7).
- Audits triggered when the title on a subject vehicle changes (which typically means the vehicle has been sold, resulting in a RUC account close out or change). DMV requires an odometer reading at the time of transfer. The odometer reading and disclosure is also required for vehicles previously titled elsewhere when Oregon titles them for the first time, even if there is no change in ownership. The “Secure Odometer Disclosure / Reassignment” (Form 735-403) includes date of transfer, vehicles identifiers (i.e., year, make, model, body style, and vehicle identification number), the names and addresses of the buyer and seller, and their signatures certifying / acknowledging the odometer reading. While several years can pass between the change in title for a subject vehicle, such odometer readings should not be required when a subject vehicle is using certified technology for automated mileage reporting. Nevertheless, the odometer disclosures when the title does change can provide the basis for an audit at account close out if so desired.³⁵

One of the issues to be addressed involves the rules and processes should the MRD / telematics based mileage be significantly different than the mileage derived from odometer readings. Some difference (up to +/- 5 percent) can be expected given the accuracy and variables associated with odometers and MRDs. There are two scenarios to consider – one in which the odometer mileage is significantly less than the MRD mileage and the RUC payer has nonetheless paid the RUC based on the MRD reading (is the RUC payer entitled to a refund, or is this a case of a potential MRD malfunction or odometer fraud?)³⁶ The second scenario is where the odometer mileage is greater than the MRD readings, in which case the RUC payer has underpaid.

6.6 Privacy

Privacy is a significant issue and concern of likely RUC payers. As discussed in previous chapters of this CONOPS, privacy concerns are addressed to some extent in the RUC system concept by allowing individuals to choose a non-location option (i.e., Basic OBU) that measures and charges undifferentiated mileage.

HB 2453B addresses “personally identifiable information,” which includes, but is not limited to, the person’s travel pattern data, per-mile road usage charge account number, address, telephone number, electronic mail address, driver’s license or identification card number, registration plate number, photograph, recorded images, bank account information and credit card number. Per the proposed legislation, ODOT, a CSP, or a contractor for a CSP may not disclose personally identifiable information used or developed in the conduct of RUC services to any person except:

³⁵ The odometer disclosure is only required for vehicles nine years of age or newer. A bill (HB 3137) is currently before Oregon legislature that allows (“may”) persons to provide an odometer reading for vehicles that are 10 years or older.

³⁶ “Odometer correction” tools are available from the web

- The registered owner or lessee of the vehicle,
- A financial institution for the purpose of collecting vehicle road usage charges owed,
- Employees of ODOT,
- A certified service provider,
- A contractor for a CSP, but only to the extent the contractor provides services directly related to the certified service provider's agreement with ODOT,
- An entity expressly approved to receive the information by the registered owner or lessee of the subject vehicle, or
- A police officer pursuant to a valid court order based on probable cause and issued at the request of a federal, state or local law enforcement agency in an authorized criminal investigation involving a person to whom the requested information pertains.

Another issue involves a tradeoff between the amount of data needed by the RUC system to support the compliance and auditing functions versus the public's desire for a certain level of privacy protection from government intrusion. In other words, how much information the public is willing to allow the government to collect, and how long may the government retain the data?

HB 2453B addresses this issue stating that "not later than 30 days after completion of payment processing, dispute resolution for a single reporting period or a noncompliance investigation, whichever is latest, ODOT and CSPs shall destroy records of the location and daily metered use of subject vehicles." Exceptions to this 30-day maximum retention requirement include:

- For purposes of traffic management and research, ODOT and Certified Service Providers may retain, aggregate and use information in the records after removing personally identifiable information.
- Monthly summaries of metered use by subject vehicles may be retained in VIN summary reports³⁷ by ODOT and certified service providers.
- A Certified Service Provider may retain the records if the registered owner or lessee consents to the retention. This consent does not entitle ODOT to obtain or use the records or the information contained in the records.

This last exception is very important to the concept of the RUC becoming a value added to other vehicle-related services provided by CSPs. Nearly all of these potential CSPs have privacy policies that allow them to retain the data they collect as part of their service offerings for much longer than the 30 days stipulated in HB 2453B. For example, a communications provider indicates that "sensitive records are retained only as long as reasonably necessary for business or legal purposes" – there really is no time constraint. A concierge services company (which uses a MRD similar to that used in the pilot) indicates that data may be destroyed sometime during a two to seven year period (depending on a variety of circumstances). A traveler information company with a phone app identifies its retention period for original information as "as long as is necessary for the purposes for which it was obtained," and the retention period for other information (e.g., for historic research, statistical purposes) as "for as long as we choose (which could be indefinitely)." When RUC payers sign up for these other services (of which RUC is a value added), they will be consenting to these extended periods of data retention (which many

³⁷ A VIN Summary Report is a monthly report provided by a service provider, which includes a summary of all vehicle identification numbers of subject vehicles and associated total metered use during the month. The report may not include location information.

of us already do). It is important to note that ODOT will not have access to this data in accordance with the provisions of HB 2453B.

6.7 Certified Service Providers (CSPs)

HB 2453B modifies the definition of a “transportation project” under the Oregon Innovative Partnerships Program to allow ODOT to enter into agreements for the collection of the vehicle road usage charge. As part of the Oregon Innovative Partnerships Program, ODOT “shall enter into agreements to undertake transportation projects the subjects of which include the application of technology standards to determine whether to certify technology, the collection of metered use data, tax processing and account management, as these subjects relate to the operation of a road usage charge system.”

The involvement of private service providers is crucial to RUC system success—and the success of future expansions—because it will allow ODOT to tap into market forces to provide data collection and payment services, thereby allowing the public to **choose** the means by which they report mileage, the on-board technology that best suits their needs, and the method of invoicing and payment. Moreover, a percentage of the motoring public may struggle with government’s mandate for the use of technology to generate revenue, even with privacy protection assurances. Access to private operation of the mileage reporting, charging, and account management activities (as an option) may alleviate these concerns, particularly in light of the fact that many individuals already provide personally identifiable information to nongovernmental commercial interests.

HB 2453B defines a CSP as an “entity that has entered into an agreement with ODOT for reporting metered use by a subject vehicle or for administrative services related to the collection of per-mile road usage charges. “ Several different types of CSPs are envisioned for the RUC, providing RUC hardware, software and services as listed below.

- **Mileage Reporting Vendor** – A private entity that provides mileage reporting devices and associated software (e.g., RUC phone apps) to RUC payers, or to ODOT or other CSPs for resale to RUC payers. This CSP may provide MRDs for which the primary purpose is not RUC (e.g., pay as you drive insurance), but nonetheless provide RUC functionality as a value added feature. It is emphasized that ODOT will not develop or manufacture MRDs.
- **Automotive Telematics Service Provider** – A private entity, including an automobile manufacturer or automotive supply chain vendor, that has access to the vehicle’s internal operating data and provides in-vehicle services (e.g., On-Star, Sync) using the vehicle’s data and other information. The RUC system would be provided access to those vehicle data necessary to accurately calculate the RUC (e.g., VIN, mileage driven in state / out of state, fuel consumed), most likely via a data collector. The telematics provider may offer RUC as a value-added service to its customers.
- **Data Collector** – A private entity that receives mileage information and other RUC-related data from the vehicle, either via the MRD or vehicle telematics. The data collector can collect data in multiple proprietary formats (e.g., from different vendors’ MRDs and / or telematics), aggregate the data, and send the information to one or more account management CSPs using the standard RUC message format.
- **Account Manager** – A private entity that provides a variety of transaction processing and account management services for RUC payers, including setting up RUC accounts, calculating the road usage charge less any gas tax credits, issuing RUC invoices and statements, receiving payments, managing accounts receivables, transmitting collected monies to the state treasury, providing reports to the RUCA, and supporting audit activities.

- **Communications Provider** – A private entity that provides wireless communications services for the transmission of RUC data to and from the subject vehicles. The wireless providers will also likely support other vehicle services for which the RUC is considered as a value added.

It is expected that many of these CSPs will be entities that owners and drivers already entrust with financial and private information such as mobile phone and credit card providers, banks and financial institutions, auto manufacturers and dealers, navigation unit providers, and insurance companies. Moreover, the same entity may perform multiple CSP functions such as the mileage reporting vendor also providing data collection functions, and a communications provider also providing account management functions.

HB 2453B stipulates that agreements among the public and private sector partners entered into for the RUC must specify at least the following:

- At what point in the transportation project public and private sector partners will enter the project and which partners will assume responsibility for specific project elements
- How the partners will share management of the risks of the project
- How the partners will share the costs of development of the project
- How the partners will allocate financial responsibility for cost overruns
- The penalties for nonperformance
- The incentives for performance
- The accounting and auditing standards to be used to evaluate work on the project
- Whether the project is consistent with the plan developed by the Oregon Transportation Commission and any applicable regional transportation plans or local transportation system programs and, if not consistent, how and when the project will become consistent with applicable plans and programs.

6.7.1 Certification

The RUC system approach to CSPs is based on the following principles:

- **ODOT sets quality requirements for CSPs.** Service providers must demonstrate their ability to record the road usage of their subscribers and calculate the associated tax with no more than a certain error percentage in the amount paid per time period. These guidelines do not tell the service provider “how” these services are to be provided; but rather describe minimal acceptable performance requirements.
- **CSPs design their own solutions for user choices.** This will allow private providers to develop and use the technology of their choosing to measure road usage and manage accounts, and to offer them to RUC payers. This will encourage innovation and creative solutions.
- **ODOT monitors CSPs,** including measuring accuracy and auditing the reconciliation of revenues. This does not mean that ODOT would “manage” the service providers; CSPs would need to operate, monitor, and manage their own systems in accordance with ODOT guidelines. This ODOT monitoring effort would be focused on ensuring that the service provider was complying with these guidelines.
- **CSPs protect the privacy of RUC payer information and account data** under strict guidelines – including those included in HB 2453B – monitored by ODOT.

- **CSPs demonstrate and operate to a highly ethical level of business behavior** in the collection and administering of RP accounts on behalf of ODOT.

These principles require that the CSPs be “certified.” Certification is defined by the International Organization for Standardization (ISO) as the “provision by an independent body of written assurance (a certificate) that the product, service or system in question meets specific requirements.” This written assurance often comes in the form of a certification mark or label applied to a product or its documentation, and/or a listing in a publicly available registry.

In general, certification of technical products and processes address standards-based conformance and interoperability testing. The certification program may be operated by a government entity or an outsourced CE with the goal to facilitate the adoption of the appropriate standards and certification processes in a given market in order to ensure that products in that market are interoperable, secure and protect consumer privacy. Key benefits of having a certification program for the RUC include the following:

- RUC payers will have confidence to sign up with CSPs and buy certified MRDs and account management and other services knowing that they have been rigorously tested, conform to specifications, and interoperate with each other.
- ODOT will have confidence that CSPs conform with the agreed-upon standards and requirements, thereby removing the need for conventional government procurement and contracting, minimizing the chance for “lock-in” with one or a few vendors.
- Vendors will be able to differentiate their certified equipment from their competitors whose equipment is not certified.
- By enforcing standards – including component and subsystem interfaces – certification helps ensure interoperability among system suppliers and their hardware and services; thereby promoting and sustaining the open system architecture model.
- By requiring technical interoperability and enforcing direct competition among RUC providers, a certification program can help bring the cost of implementation down and stimulate demand within the open system architecture.

Certification testing consists of two types of testing that serve distinct purposes: conformance and interoperability. CSPs and their equipment and services must pass all mandatory test cases from both tests to get certified:

- **Conformance testing:** Testing conducted to measure a CSP’s, and their specific device’s or processes’ conformance to specific standards.
- **Interoperability testing:** Testing conducted to measure the ability of specific equipment to operate with other devices and CSPs.

This is very similar to what was done to test and accept the vendors involved in the RUCPP pilot – unit testing of individual components against the system requirements; followed by “integration testing” to validate the end to end functionality of the vendor’s offerings by chaining multiple disparate subsystems together, and evaluating how each component and subsystem operated with other subsystems and components. There was also a system acceptance test of the overall end-to-end RUCPP, including testing of ODOT provided services, which served as a dry run for the deployed RUCPP pilot demonstration prior to full operation involving all of the pilot participants. The certification process for the actual RUC will include this and other additional areas of certification, including:

- Technical considerations, such as conformance of the MRDs (and any Smartphone apps), data collectors, and road charge processing functions to the SRS and ICD.
- Business processes, particularly account management entities and their invoicing, customer service and related processes
- Fiduciary processes, focusing on accounting practices and management of RUC (i.e., tax) revenues in accordance with ODOT rules
- Financial capability (i.e., minimal risk of going out of business), including a review of a potential CSP's financial statements and accounting data
- Mapping for the advanced method of mileage reporting (i.e., ODOT will not provide maps)

Several issues still need to be addressed and resolved with respect to the RUC certification process. One involves the standards on which to base certification. HB 2453B required ODOT to “adopt standards for open system technology used in methods”, and to “collaborate with agencies of the executive department to integrate information systems currently in use or planned for future use.”

The SRS and ICD are currently being updated and expanded as previously discussed. These are “technical” standards, and as such, do not address all the CSP processes that will need to be certified for the RUC. Examples of other standards against which CSPs may be certified in the future are listed below:

- ISO 9001:2008, which sets out the criteria for a quality management system. It is based on a number of quality management principles including a strong customer focus, the motivation and implication of top management, the process approach, and continual improvement.
- ISO 27001, which covers information security management.
- Customer service (interaction of an organization with the customer throughout the phases of service provision) including help desk operations. (As an example, the J.D. Power's Certified Call Center Program entails an audit of eligible call centers measured against 118 leading practices across the call center operations and support functions).
- Dun and Bradstreet ratings as to a company's financial capability.

These and other standards, and relevant guidelines, will be reviewed and analyzed during the early stages of the RUC implementation. In identifying and adopting the RUC standards and guidelines for certification, it is important that these standards not be so stringent and the associated testing so difficult so as to allow only a few (or less) vendors to provide RUC hardware and services, a scenario that is contrary to an open system. Too stringent certification processes will also likely increase costs. Similarly, the certification process should not be a hindrance to innovative ideas and approaches, including other services to which RUC may be a value added. It is possible that adding a new technological innovation will violate an existing certification requirement.

In addition to identifying and adopting the various standards, other activities of the certification process include the following:

- Develop and approve test specifications and testing procedures / scripts.
- Develop and validate testing tools and systems (e.g., the protocol exerciser used for the RUCPP).
- Receive and process applications from potential CSP.

- Identify, review, and approve test labs and processes. This may include compliance to certain standards (typically ISO or NIST standards) relating to running a test lab.³⁸
- Conduct certification testing of vendor hardware, software and services, either in house or by a lab.
- Review test results.
- Issue for RUC equipment – assuming the equipment passes – a certificate of compliance and/or interoperability to the supplier, allowing the supplier’s device to be placed on qualified purchasing lists (QPL).
- Issue for CSPs – assuming their respective processes pass – a certificate of compliance and/or interoperability to the CSP, allowing the CSP to be placed on the approved list of CSPs.
- Develop and manage some sort of appeals process in the event that a vendor fails to pass the testing. It is always possible that the vendor has a new technological innovation that could be beneficial to the RUC, but that violates an existing certification requirement.
- Review/approve enhancements to the certification program.

A related issue is the period of certification. Provided that all terms are defined, certification can be valid for the life of the product and as long as the manufacturer remains in good standing and there are no device changes affecting design, manufacturing or performance. Any *major* change to the CSP system design or upgrade performed after initial acceptance may require a repeat of initial certification testing. Re-testing may also be necessary if the audit activities discover issues and problems.

Another issue is who will be responsible for performing the certification, including the extent to which “self certification”³⁹ will be used. It is envisioned that ODOT perform the certification activities at the start of the RUC system. However, as the RUC system expands in terms of the number of subject vehicles and the number of vendors and entities interested in providing RUC hardware and services, management of the certification process may be given to a Certification Entity (CE). This CE (or possibly multiple CEs) will be an independent body that will, on behalf of ODOT, develop, manage, and administer the RUC certification program, including assessing and determining whether system components comply with the RUC standards for functionality, interoperability and acceptable business practices. Consideration should be given to whether the CE is itself accredited and implements the various ISO standards for certification (e.g., ISO/IEC 17021:2011 – “Conformity assessment – Requirements for bodies providing audit and certification management systems”).

Other issues associated with the use of a CE is the time for them to set up the certification program, the cost (and who is responsible for the costs), and the extent to which the CE will assume responsibility (e.g., bonding) if a RUC device or process does not function properly, potentially resulting in lost revenues for the state.

6.8 ODOT Organization

ODOT is the state’s revenue-charging entity and collection agency for fuel taxes (managed by the Fuels Tax Group [FTG] within ODOT) and for weight-mile tax on trucks and other heavy vehicles (managed by the MCTD). Moreover, DMV is also part of ODOT. In the context of the RUC system, ODOT will continue this function of collecting taxes (i.e., the road usage charge).

³⁸ For example, ISO 17025:2005 - General Requirements for Competence of Testing and Calibration Laboratories

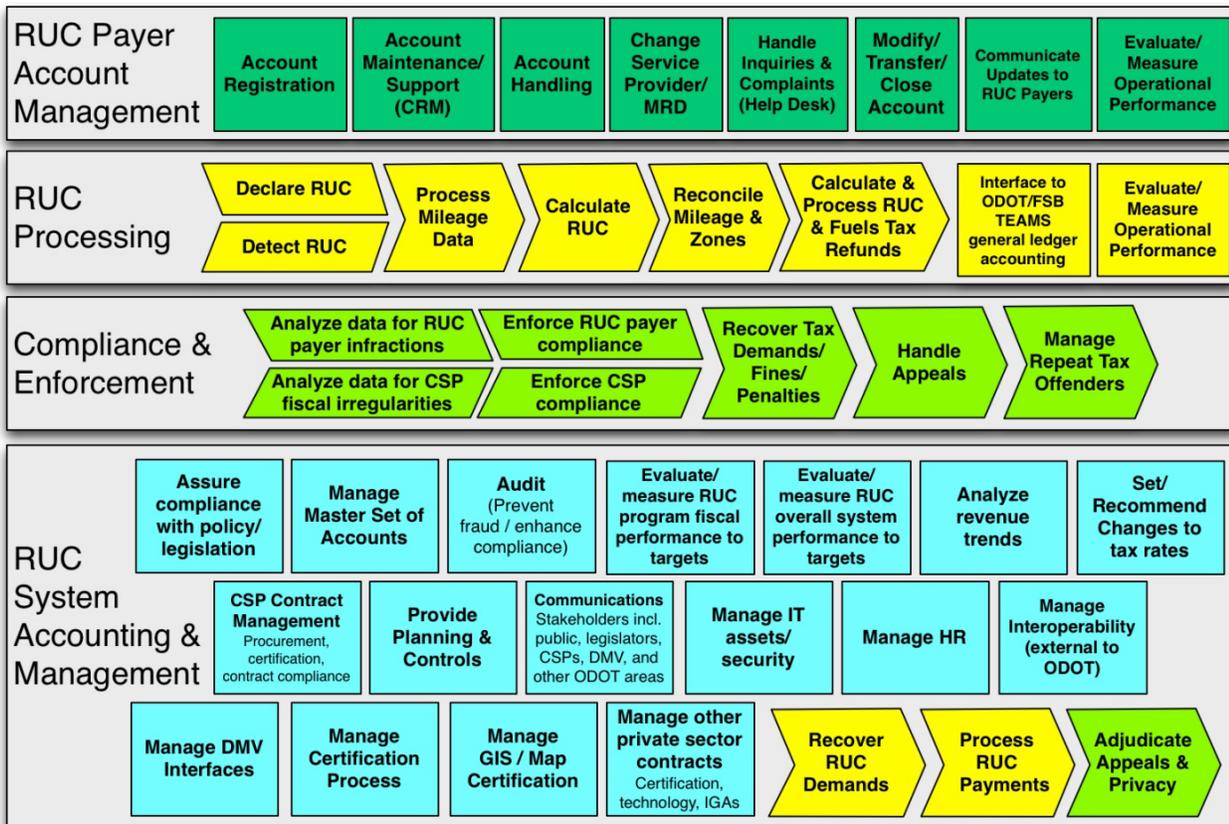
³⁹A formal assertion by a CSP that their offering conforms to the associated standards

Figure 20 presents a conceptual functional organizational structure, identifying multiple different functional categories. These categories are grouped as follows:

- **RUC Payer Account Management** – As previously discussed, the RUC concept envisions most of the account management functions to be performed by Certified Service Providers, with the RUC as a value-added service to these CSP’s standard offerings. Nevertheless, ODOT will need to assume account management responsibilities for those RUC payers who desire to use a government process for RUC (for the Basic / undifferentiated mileage reporting approach only), for those who must use the manual mileage reporting method as a fallback, and for those who cannot qualify for a private CSP account as the “provider of last resort”. It is also envisioned that ODOT will likely manage the High Flat Annual RUC accounts (assuming no CSP desires to have such accounts, given that there is minimal opportunities for offering other services with this approach).
- **RUC Processing**– ODOT’s involvement with these data collection and transaction processing activities is expected to be minimal, except for RUC payers who desire a government account manager and a basic (undifferentiated) approach to mileage reporting. Moreover, ODOT will not provide or sell MRD devices; that will remain the responsibility of the private sector (i.e., MRD CSPs). It is also assumed that any data collection activities will be outsourced.
- **Compliance and Enforcement** – ODOT will oversee the RUC compliance program as previously discussed in Section 6.5, including the public outreach and communications efforts. It is also envisioned that ODOT would place liens on subject vehicles that are delinquent in payment or otherwise trying to defraud the RUC.
- **RUC System Accounting and Management** – The numerous RUCA functions – as discussed in Section 6.4 – will be housed in ODOT. There is currently no plan to outsource these responsibilities (although selected functions, such as managing the certification process as the RUC expands, audit assistance, and RUC evaluation, remain a possibility). Additionally, ODOT will be responsible for adopting standards and developing requirements for an open system, for the management and oversight of agreement and contracts with Certified Service Providers and Certification Entities, for ensuring privacy of personally identifiable information included within the RUC system, and for developing system performance measures and evaluating the RUC operation against these measures and metrics.

Several ODOT organizational framework alternatives are being considered for the day-to-day operation and tax management functions associated with these RUC responsibilities. It is envisioned that the framework will include some combination of the existing groups within ODOT – including the MCTD, the FTG, and the Office of Innovative Partnerships and Alternative Funding (OIPP) – with DMV providing vehicle data to RUCA to identify subject vehicles and associated RUC payers.

Figure 20
Organizational Framework Model



The development and evaluation of alternative frameworks encompasses several considerations, including:

- Functional Fit – Similar experience, such as the MCTD familiarity with a “tax by mile” approach, the FTG familiarity with the current fuel tax and the use fuel seller tax program⁴⁰, and OIPP’s familiarity with the overall RUC concept and contracting / agreements (having managed the RUC pilots).
- Level of IT development needed – Including the ability to dedicate IT resources as compared to sharing such IT resources among multiple groups and divisions within ODOT.
- Open Systems Concept – The ability to support and sustain the critical open systems approach for the RUC, enabling broad areas of the private sector to innovate and produce continually more cost effective technology solutions. OIPP has flexibility in procuring RUC services as provided under the OIPP statute.
- Costs and additional in-house staff required.

It is likely that whatever organizational framework is defined, it will change over time as the RUC system grows and matures.

⁴⁰ In which retail fuel stations collect the tax from motorists for a fee and remit them to ODOT, in much the same way a CSP would collect mileage fees from its accounts and remit them to ODOT for a fee.

6.9 Evaluation and Performance Measures

Performance measures provide the basis for evaluating the effectiveness of implemented programs, operational strategies, and tools with respect to the goals and objectives of the program. Increased customer expectation and public sector accountability have helped focus attention on performance measurement as one of the essential tools of transportation management; this will be particularly true for any mileage-based road usage charging system. In essence, without measuring results, success can't be discerned from failure. If success can't be defined, it can't be rewarded; and if failure can't be defined, it can't be corrected.

Ongoing evaluation will be an integral part of the RUC system operations, including the following:

- Basic measurements of performance from technical, business, and user perspectives
- Guidance for continual modifications of the system, including bringing it into compliance when necessary
- Useful measures for monitoring performance of and possibly providing incentives for system contractors and service providers
- Reassurance that the system is performing according to policy requirements and established goals
- Increased confidence on the part of the public that all key system impacts are being considered.

Table 5 provides a partial list of potential performance measures. These are based in part on the "Evaluation Strategy" document, and will be updated as the system development process proceeds. In finalizing the RUC performance measures, due consideration will be given to the following attributes for good performance measures:

- **Goals and objectives** – Performance measures should reflect the goals and objectives for the RUC system, including validation of the objectives.
- **Limited number of measures** – All other things being equal, fewer rather than more measures is better. Too much information, too many kinds of information, or information presented at too fine a level can be overwhelming.
- **Ease of collection** – The data required for performance measures should be easy to collect and analyze, preferably directly and automatically.
- **Data needs** – At the same time, performance measures should not be solely defined by what data are readily available. Data needs and the methods for analyzing the data should be determined by what it will take to create or "populate" the desired measures.
- **Sensitivity** – Performance measurement must be designed in such a way that change is measured at the same order-of-magnitude as will likely result from the implemented actions.
- **Facilitate Improvement** – The ultimate purpose of performance measures must clearly be to improve the operation of the RUC system and the financial sustainability of transportation funding.
- **Simple and understandable** – Within the constraints of required precision, accuracy, and facilitating improvement, performance measures should prove simple in application with consistent definitions and interpretations.

Table 5
Potential Performance Measures for the Oregon RUC System

- General System Performance
 - Numbers and types of accounts
 - Numbers of MRDs distributed, operated, and returned (by type); and numbers of vehicles using telematics for RUC
- Taxpayer Services (from surveys)
 - General ease of use of and cost to comply with the RUC system
 - Perceptions of accuracy of data reported
 - Perceptions of system fairness, transparency, and protection of privacy
 - Account setup, queries, change, and cancellation
 - Payments
 - Complaints
- RUC Payer Services (other metrics related to how users choose to interact with the system)
 - Account management calls (purpose of call, average waiting times, call drop outs)
 - Web-based interactions (types of interactions, processing time)
- Administration and Finance
 - Revenues by mileage reporting options (undifferentiated, differentiated, switchable annual fee, manual)
 - Transactions by payment channel (for example, web, credit card, mail, cash)
 - Average lag from invoice to payment (for post-pay options)
 - Shadow revenue (i.e., the revenue that would have been paid by vehicles had they been subject to fuel tax, along with a comparison of shadow revenues vs. actual revenues)
 - Expenditure, by cost category, average cost per payment transaction, enforcement, and audit/reconciliation costs
 - Total cost of system operations relative to costs of fuel tax administration
 - Administrative burden on private sector
 - Accounts receivable
 - Irregularities (e.g., multiple accounts for same vehicle)
- Technology
 - MRD mean time before failure (by type and manufacturer)
 - Integration with telematics and in-vehicle displays
 - Anti-tampering considerations
 - Other services offered with RUC as a value-added
 - System hardware and software (accuracy, reliability, security, energy consumption)
- Central Systems
 - Account management and RUCA performance:
 - Software and database management performance
 - Communications systems performance
- Maintenance
 - Account management and tax accounting (impacts of service availability)
- Enforcement
 - Numbers of violations identified and classifications of violations
 - Notices issued and responses to them
 - Average time to “close” violations and associated costs
 - Revenues from enforcement
- Certification Process
 - Number of applications for certification, by system function
 - Mean time to evaluate and certify (by system function)
 - Number of accepted/rejected application

6.10 Context within the National and Statewide Intelligent Transportation System (ITS) Architectures

The National ITS Architecture, maintained by the USDOT, is a comprehensive, common, and mature framework for developing and integrating transportation systems at the state and regional levels. The National ITS Architecture serves as a guide for ITS professionals to develop integrated transportation systems. The development of a statewide or regional ITS architecture typically begins with the National ITS Architecture and is customized based on statewide and regional characteristics (for example, transportation needs, existing and planned ITS deployment, and responsibilities). This customization typically occurs by mapping existing, planned, and desired statewide/regional transportation systems to the National ITS Architecture subsystems and service packages.

FHWA Rule 940, which became effective in 2001, implemented section 5206(e) of the Transportation Equity Act for the 21st Century (TEA-21), requiring ITS projects that are funded, in whole or in part, with the highway trust fund to conform to the National ITS Architecture and standards. The rule states that “conformance with the National ITS Architecture is interpreted to mean the use of the National ITS Architecture to develop a regional ITS architecture, and the subsequent adherence of all ITS projects to that regional ITS architecture.” While none of the recent RUC activities to date have used federal funds – in part due to the fact that mileage-based user fee projects of any sort have generally not been eligible for federal funding– this may change in the future. If so, then conformance with the national architecture will be an important consideration.

Version 7 of the National ITS Architecture, released in 2012, included a new service package⁴¹ for “VMT Road User Payment”. It is described as follows:

This service package facilitates charging fees to roadway vehicle owners for using specific roadways with potentially differential payment rates based on time-of-day, which specific roadway is used, and class of vehicle (a local policy decision by each roadway owner). Vehicle owners need only register with a single payment entity of their choice (a participating state, municipal, or regional DOT, an authority, or a private entity), and payments are reconciled by the entity receiving payment (and travel history) with all roadway owners that participate in the VMT payment scheme, which may also include the Federal government. Vehicle owners would pay nothing for distances traveled where there are no payments required (e.g. in jurisdictions that have not implemented a distance based payment or for roadway operators that collect payment using traditional tolls), although a Federal payment rate might cover some or all roadway operations (a Federal policy decision). Basic operation depends on the vehicle tracking its own location, and periodically reporting its travel history to the registered entity receiving payment using C-V communications. Roadway VMT Payment can duplicate the functions of current toll road payment schemes based on F-V communications, parking payment functions, as well as augment and/or replace federal and state gasoline taxes (which are otherwise ineffective for vehicles that don't use gasoline).

The Oregon RUC conforms to this broad service package description. Moreover, the Oregon statewide ITS architecture has adopted this VMT service package.

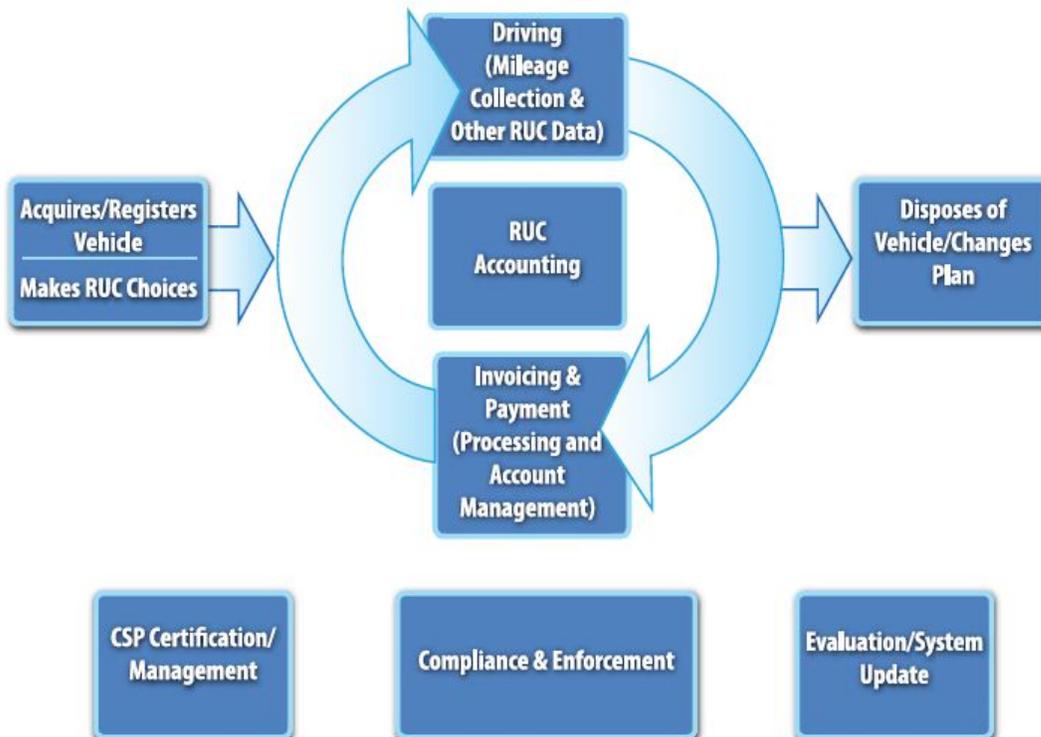
⁴¹ Formerly known as “market packages”

7 Operational Scenarios

This section provides examples of representative scenarios for the RUC system concept, describing how the RUC system will be used and operated when fully implemented. The examples are not meant to be all inclusive, but they do provide an understanding of the interaction and information flows among system components, processes, and stakeholders, as well as some of the issues still to be resolved during final system design (including discussions with potential vendors and CSPs) and implementation, along with the rule making activities identified in the legislation.

The discussion herein assume that the RUC system configuration and components have been implemented for “Day One” operation as described in Chapters 5 and 6, including multiple CSPs to provide most of the RUC elements and services. The operational scenarios have been divided into the categories shown in Figure 21. Each of these functions involves multiple scenarios as outlined below:

Figure 21
Oregon Mileage Fee Concept Pilot Configuration



- Preparatory RUC Accounting Activities
 - Identifying Vehicles that are Subject to RUC (mandated)
 - Develop Certification Processes
- Acquire / Registers Vehicle; Makes Choice
 - Providing Information on Available Choices
 - RUC Payer Acquires New Vehicle
 - Owner / Lessee Desires to Pay RUC (Volunteer)
 - RUC Payer Moves Into State with Vehicle Subject to RUC

- RUC Payer Changes Desired Choice
- Driving / Mileage Collection
 - In State on Public Roads
 - In State on Private Property
 - Out of State
 - Out of State Driver in Oregon
 - Obtaining Credit for Fuel Tax Paid
- Invoicing and Payment
- Disposal of Vehicle
 - Vehicle Sold
 - Vehicle Moved Out of State
 - Vehicle Stolen
 - Vehicle Destroyed
- Compliance
 - Owner / Lessee of Subject Vehicle Does Not Set Up RUC Account
 - RUC Payer Tamper With / Removes Device
 - RUC Payer Does Not Pay
- Failure Conditions

Each scenario is briefly described along with assumptions. The stakeholders and their activities and the associated interaction with one another are then discussed (in a logical temporal sequence to the greatest extent possible). This is followed by a list of potential issues (and activities) that will need to be addressed as the system's concepts, policies, and designs are further refined. How the scenario may change over time is also described.

7.1 Preparatory RUC Accounting Activities

The numerous RUCA activities, as discussed in Section 6.4, are on-going processes that will occur throughout all of the scenarios described herein. There are, however, several preparatory milestones that must be accomplished before the RUC commences operation on July 1, 2015, including the ones described below.

7.1.1 Identifying Vehicles that are Subject to RUC (Mandated)

Context and Assumptions –Per the current legislation, all 2015 model year vehicles (and later) that get 55 MPG or MPGe or greater, are subject to the RUC. ODOT and DMV have already commenced discussions regarding processes by which ODOT RUCA can obtain information from DMV on registrations (and associated vehicle information) within the state, with this information being updated on a regular basis as additional vehicles are registered (or the registration is cancelled / changed due to a change in ownership / lessee or the vehicle is moved out of state).

Stakeholder Activities

- ODOT RUCA – Identify those vehicle makes, models and years that get 55 MPG / MPGe or greater. This can be done by using the EPA website (<http://www.fueleconomy.gov/feg/PowerSearch>) and performing a search for all makes and models that get 55 MPG / MPGe (combined and above). Detailed information on specific vehicles

can also be obtained by using the VIN number (from the DMV database), although this may not be true for all vehicles.

- ODOT maintains and updates the list of subject mandatory vehicle makes and models, making the information available on a RUC website (and presumably the DMV website), with brochures and other written material available at DMV offices and at auto dealerships.
- ODOT also identifies those subject vehicles for which the technology-based solutions may not work (e.g., no OBD-II port, non-standard OBD-II and the required reverse engineering to identify the specific PIDs has not been performed, no compatible telematics capability), thereby requiring the owners / lessees of these vehicles to adopt one of the fallback approaches.

Issues

- The EPA website provides MPG / MPGe information for the most standard models. There may be variations to these models in terms of engine size, battery capacity, etc., that might have an impact on individual vehicles actual MPG/MPGe. These potential variations will need to be accommodated in the process.
- The actual fuel efficiency (and fuel tax paid) for plug-in hybrid electric vehicles (PHEV) can vary widely depending on driving habits (e.g., how far each trip is) and the frequency of re-charging. For example, the Toyota Prius PHEV is rated at 95 combined MPGe for electric driving – a value that puts it into the mandatory category. However, the Prius' MPG rating for "gas only" is 50 MPG – less than the 55 MPG minimum mandated for RUC participation. A rule will need to be established for how to rate the MPG / MPGe for PHEVs. (Note – The legislation states that a mandatory vehicle has a "rating of 55 miles per gallon of gasoline or above or 55 miles per gallon of gasoline equivalent or above". PHEVs fall into the 55 MPGe or above category, and are therefore likely subject to the RUC; but this should be clarified by a rule.)

How Scenario May Change Over Time:

- Technology and the vehicle value-added market are continually changing. Policy and legislation may also modify the minimum MPG requirements as well. Identifying the make and model (and year) of subject vehicles, and which of these are compatible with existing RUC technology and choices will be an on-going process.
- Developing the process for identifying those subject vehicles for which available technology-based solutions may not work, and therefore eligible for one of the fallback options.

7.1.2 Develop Certification Processes

Context and Assumptions –The certification of RUC service providers constitutes several likely scenarios, including:

- A potential service provider desires for its hardware, software, and/or services to be RUC certified, and the associated "application" process the vendor must go through to achieve this
- The actual testing and evaluation processes to become certified. This certification scenario will likely involve several variations, depending on what type of RUC device or service is being evaluated. It is envisioned that certification will address technical requirements and specifications (e.g., SRS and ICD), business processes including customer relationship management, fiduciary process such as accounting practices and management of RUC revenues, and financial capability to perform RUC services.

- The process should the private entity fail the certification process and wishes to “appeal” the decision, or resubmit the device / services for re-testing.
- Recurring certification audits
- Re-certification as technology and / or standards change.

The certification process is discussed in generic terms in Section 6.7.1. One of the initial activities following passage of the legislation will be to define the RUC certification process in greater detail, including the stakeholder activities noted below.

Stakeholder Activities

- ODOT RUCA – Identify the appropriate standards and guidelines on which to base certification. In addition to the SRS and ICD (which are technical in nature), other standards, including those currently in use by other agencies of the Oregon executive department, will need to be identified and evaluated.
- ODOT will also need to identify and define the testing and evaluation process associated with each RUC component and subsystem, including who is responsible for setting up the test environment and providing test equipment, conducting the test, and observing and documenting the test results. This also includes identifying when self-certification (i.e., using vendor-provided test and certification results) is appropriate, and for which components and under what circumstances.
- Potential Vendors – Follow these certification processes to become CSPs

Issues

- In identifying and adopting the RUC standards and guidelines associated with certification, it is important that these standards not be so stringent and the associated testing so difficult that the resulting process allows only a single vendor (or very few) to provide RUC hardware and services, significantly increases RUC implementation costs, or hinders innovative approaches that might enhance the RUC and/ or reduce system costs.
- The time required for the testing and certification effort relative to the July 1, 2015, start date of RUC operation is short.

How Scenarios May Change Over Time

- The standards and guidelines on which the RUC certification processes are based will likely change over time. Moreover, innovative approaches (including making RUC a value-added feature to other services) will be introduced in the market. The certification process will need to evolve to accommodate such changes.
- While ODOT will likely perform the certification prior to and shortly after the start of the RUC, as the system grows and more vendors become interested in providing RUC services and components, it may become necessary to outsource the certification processes to an independent CE.

7.2 Acquire / Register Vehicle; Make Choice

The following scenarios involve the RUC payer interacting with the RUC system when acquiring a vehicle and/or becoming subject to the RUC system, in coordination with several other entities and stakeholders.

7.2.1 Providing Information on Available Choices

Context and Assumptions - RUC payers can find out about their choices from a number of different sources, including:

- ODOT website (with also a link from the DMV website)
- Brochures available at DMV offices
- Information provided by the dealer
- Advertisements and marketing by CSPs (including to existing customers of the CSP)

Stakeholder Activities:

- DMV, ODOT, CSPs, dealers and any others providing information on available RUC choices must develop materials to provide on websites, advertisements, brochures, etc.

Issues

- If for some reason, the information on available choices is not provided by dealers (as assumed above), the information will need to be during the vehicle registration process.
- Changes to DMV and other Oregon state websites to provide RUC choice information
- Perhaps some process to ensure a degree of “truth in advertising” from CSPs.

How Scenario May Change Over Time:

- As the system matures, the number of choices, including value-added scenarios, will increase; and the information sources will need to be updated to reflect these additional choices
- More bundling of services; both in terms of RUC becoming a value-added component to other vehicle services (e.g., PAYD insurance, telematics services), and CSPs joining forces to provide a complete RUC (and other services) package.

7.2.2 7.2.2 RUC Payer Acquires New Vehicle from Dealer

Context and Assumptions: An Oregon resident decides to purchase or lease a new subject (mandatory) vehicle.

Stakeholder Activities:

- In addition to the normal paperwork for insurance, vehicle title, and DMV registration, RUC payers also sign a form acknowledging that their new vehicles are subject to the RUC, that they are required to choose a method and set up an account, and then to notify the ODOT RUC of these choices within a stipulated period of time following the date of the vehicle purchase or lease. The acknowledgement is forward to RUCA by the dealers.
- The RUC payers subsequently review the available choices, select a desired mileage reporting approach and account manager, and set up their respective accounts.
- As an alternative, the RUC payer may make the RUC choices and set up an account while at the dealer. One likely example of this could be the purchase or lease of a vehicle with telematics capabilities (e.g., GM’s OnStar, Ford’s Sync, Mercedes’ Embrace, Toyota’s Entune) with RUC as a value-added service, and the RUC payer selects this option package from the dealer. Under this scenario, the dealer would notify the RUCA of the choices and other RUC account information as part of the account set up. This alternative scenario could also occur for other options (e.g., external MRDs) as well.

- The account manager selected by the RUC payer activates the RUC account, notifies RUCA, and the RUC Payer is sent any necessary equipment (e.g. MRD) for installation in the subject vehicle.

Issues:

- Changes to dealer paperwork/forms/processes (including online capability directly to RUCA) for acknowledgement that the vehicle is subject to RUC, and also for account set up (including choices) should the RUC payer make the RUC choices when purchasing or leasing the vehicle.
- Establishment (presumably by rule) of the maximum time between vehicle purchase / registration and RUC acknowledgement and RUC account set up. (e.g., 3 weeks). Similarly, identifying what happens if the owner / lessee of the subject vehicle does not choose or notify the ODOT RUCA of his/her choices (e.g., assumed that he/she has opted for the “flat rate” option).

How Scenario May Change Over Time:

- Dealers may have arrangements with one or more CSPs to offer their respective plans as part of the registration process; or may become CSPs themselves.
- Should a RUC payer, with an existing subject vehicle and RUC account, purchase / lease a new or replacement vehicle, the dealer can facilitate updating the account with the new / additional vehicle information.

7.2.3 Owner / Lessee Desires to Pay RUC (Voluntary)

Context and Assumptions –Per the current legislation, owners / lessees of vehicles that have a rating of less than 55 miles per gallon of gasoline (or less than 55 miles per gallon of gasoline equivalent) may apply to ODOT for the RUC. The legislation requires ODOT to approve a “valid and complete application” if:

- The applicant is the registered owner or lessee of a voluntary vehicle,
- The voluntary vehicle is equipped with a method for collecting and reporting the metered use (i.e., mileage) by the voluntary vehicle,
- The voluntary vehicle has a gross vehicle weight rating of 10,000 pounds or less, and
- Approval does not cause the number of voluntary vehicles active in the RUC program to exceed 5,000.

Stakeholder Activities

- ODOT RUCA – Develop the volunteer application. This will require some minimum criteria for the vehicle, including compatibility with the available (and certified) mileage reporting devices (e.g., a standard functioning and available OBD-II port) or telematics data protocols, and possibly a minimum allowable MPG rating such that the fuel tax credit does not significantly exceed the mileage-based RUC charge.
- Owner / lessee fills out application to participate in the RUC
- ODOT RUCA reviews and approves (or does not approve) applications, and notifies the vehicle owners / lessees of this decision.
- ODOT RUCA provides a list of approved volunteer vehicles and owners / lessees (and other appropriate information such as address) to CSPs, particularly MRD providers, data collectors, and account managers. The list is updated on a regular basis (with the time interval between

updates to be determined). This could be a web-based tool available only to CSPs and DMV. ODOT RUCA also provides this information to DMV (assuming DMV desires or needs such information regarding (volunteer vehicles).

- Owner / lessee make choices and set up RUC account with CSP

Issues

- The extent to which vehicle rated MPG is included in the volunteer application and evaluation criteria. The current rate of 1.55 cents per mile (as defined in HB 2453B) is equivalent to the amount of Oregon gas tax paid (at 30 cents / gallon) for a vehicle that averages 19.35 MPG. As the estimated amount of gas tax paid for a subject vehicle is to be credited or refunded to the RUC payer, any volunteer vehicle that averages less than 19.35 MPG will end up with a net refund relative to the mileage-based RUC.
- Finalizing the method (e.g., website) for disseminating the list of approved volunteer owners / lessees and their vehicles to CSPs.
- Process for ensuring the number of volunteer vehicles does not exceed 5000 (probably a straightforward database exercise).

How Scenario May Change Over Time

- The volunteer RUC program only lasts for 2 years per legislation.
- Policy and legislative changes may impact the maximum number of voluntary vehicles.
- After the RUC program has been in operation, individuals who are purchasing or leasing a new car may wish to opt into the volunteer program at the time of registration, making this scenario more like that for mandatory vehicles.

7.2.4 RUC Payer Moves into State with Subject Vehicle

Context and Assumptions: An owner/lessee of a subject vehicle moves from another state to Oregon. It is also assumed that as part of the relocation process, the new resident has investigated the various DMV requirements (e.g., via the DMV website) for vehicle registration, title, license, etc., which also includes information on the RUC system and associated requirements (e.g., subject vehicles), approaches, and service provider options.

Stakeholder Activities:

- New resident registers the vehicle.
- As part of the registration process, the new resident reviews available information on the RUC system and chooses an approach / technology for mileage reporting and an account manager (ODOT, CSP).
- New resident contacts the chosen account manager (and possibly a MRD technology provider), and sets up an account. New RUC Payer installs MRD in the vehicle (if applicable), and account manager notifies RUCA of new account.
- As part of the liaison and recurring data exchange between DMV and RUCA, registration and title information - including an odometer reading (as included on the title form when a vehicle moves into Oregon and registers) – is transferred to RUCA.

- RUCA performs compliance check to ensure that new registrant has also set up a RUC account. If not, RUCA sends a reminder to the vehicle owner / lessee, with a stipulated maximum time period to choose and set up an account.

Issues:

- New residents are required to title and register the vehicle, including obtaining Oregon license plates, within 30 days of moving to Oregon. However, per discussions with DMV, it appears that many new residents ignore the 30-day requirement, waiting to register their vehicle in Oregon until the current out-of-state registration and plates are about to expire. There is minimal enforcement in this regard; and it will likely impact the RUC system operations as well. If the new resident is waiting to register the vehicle, they will likely wait to set up a RUC account, thereby avoiding the RUC for the same period of time. Possible considerations in this regard include:
 1. For those new RUC payers that do go beyond the 30-day maximum period, consider charging pro-rated High Flat Annual RUC as the default compliance method (plus possibly a late fee/penalty) when they do finally register their vehicle, assuming that the proof of residence has information as to when they became residents.
 2. Because out-of-state vehicles are not subject to the RUC (in Day 1 System), there appears to be very little that can be done in the way of cost-effective enforcement of this scenario.
- Changes to DMV and other Oregon state websites to provide information on the RUC and changes to the DMV registration/title process to include proof of having established a RUC account and any necessary technology equipment.
- Possible changes in legislation (or perhaps by rule) to include the High Flat Annual RUC as a default, plus possibly late fees, for new residents (RUC payers) that fail to set up an account and / or install the necessary equipment (e.g. MRD) within the first 30 days of their residency.

How Scenario May Change Over Time:

- As additional states implement a (presumably compatible) RUC system and a regional clearinghouse is established, should the subject vehicle owner / lessee come from a state with a RUC and with a CSP account, the RUC payer works directly with the associated account management entity to update address and transfer the account to Oregon. The account management entity notifies the ODOT RUCA office of the change.

7.2.5 RUC Payer Changes Desired Choice

Context and Assumptions: The RUC payer decides to change the method of reporting miles and/or account manager. This may involve moving from one CSP to another (e.g., better price and/or preferred value-added services); moving from a CSP to ODOT account; moving from an ODOT account to a CSP; or changing from an ODOT technology approach to the High Flat Annual RUC approach (at the beginning of the year only), or vice versa.

Stakeholder Activities:

- To change to a different account management CSP, the RUC payer works directly with the new and previous account management CSPs to uninstall and return the existing MRD (if applicable), equip the vehicle with new technology (MRD or telematics), and set up a new account. The new CSP notifies the ODOT RUCA of the change in approach and account (presumably as part of the

regular reporting processes from CSP account managers to RUCA.) The previous CSP may also notify the ODOT RUCA of the change.

- For a change from a CSP to an ODOT account, the RUC payer sets up a new account with the entity within ODOT that provides RUC account management, and also works directly with the current CSP to uninstall and return the existing MRD (if applicable). The previous CSP then notifies the ODOT account management section that this has been accomplished (activating the new ODOT account), and also notifies the ODOT RUCA office of the change in approach and account.
- For a change from an ODOT account to a CSP account manager, the RUC payer has his/her selected CSP set up a new account. The CSP also works with the RUC payer on equipping the vehicle with the new mileage reporting technology (MRD or telematics), notifies ODOT RUCA office of the change in account and approach, and also notifies the ODOT account management entity of the change. The ODOT account management section closes out the RUC payer's account.
- For a change from the High Flat Annual RUC approach to a technology-based approach, the RUC Payer notifies the ODOT account management entity to change the account⁴². The RUC payer then equips the vehicle with mileage reporting technology (MRD or telematics), notifying the ODOT account management entity when this has occurred. The change in account is finalized when mileage data is received. The ODOT account management section also notifies the ODOT RUCA office of the change in approach.
- For a change in mileage reporting approach only (e.g., from a Basic MRD to an Advanced MRD, or vice-versa), but no change in account management CSP, the RUC Payer works directly with his / her current account management CSP, who in turns notifies RUCA of the change in the RUC payer mileage reporting approach. (Note – This assumes the account management CSP offers the new mileage reporting approach desired by the RUC payer. If not, this involves a change in account management CSP has described above.

Issues:

- Include language (e.g., legislation, rule, CSP certification guidance and requirements, and public-private partnership agreements) regarding:
 1. Who is responsible for notifying the RUCA of any and all changes in accounts or mileage reporting approaches
 2. Who is responsible for replacing the existing mileage reporting technology with the new technology, and who is responsible returning any removed technology to the previous CSP.
 3. Maximum time period for CSPs to report to RUCA the changes in account and reporting method.
 4. When a RUC payer is allowed to change to the High Flat Annual RUC approach (e.g., beginning of the quarter).
- Perhaps include a manual odometer reading as part of this technology change process that can be used in the overall auditing and compliance process

⁴² It is assumed that the High Flat RUC will only be administered by ODOT.

How Scenario May Change Over Time:

- As the number of choices and options increase – including cost variations and value-added services offered – the number of changes by RUC payers may also increase.
- Over time, as the number of CSPs, subject vehicles, and RUC payers increase, a new scenario may present itself – **a CSP drops a RUC payer account**, and the RUC payer has no recourse but to change to the ODOT account manager as the “provider of last resort”. There are, several potential issues with such a scenario that will need to be examined and resolved – for example, potential certification guidelines identifying the circumstances under which a CSP may drop a RUC payer (e.g., non-payment for a minimum time period, tampering and / or attempted fraud); the process by which RUC payer account records are transferred to the ODOT account management section and notifying the RUCA of the change; the process and time considerations for changing (if required) the mileage reporting method and associated technology, as might be required if the CSP also provided the MRD, or if the RUC payer was using an Advanced MRD (assuming that the ODOT account management section will not handle differentiated mileage on a permanent basis); and the extent to which the High Flat Annual RUC becomes a default approach for such a scenario.

7.3 Driving / Mileage Collection

The following scenarios address what occurs while the RUC subject vehicle is being driven, either by the RUC payer or another person (presumably with the approval of the RUC Payer). They focus on the processes and driver activities for recording the appropriate mileage and for obtaining any credits or refunds as stipulated in the current legislation. As a general rule, the RUC system concept relies on technology for automatically measuring, reporting, and transmitting mileage and other vehicle data required for transaction processing and calculation of the RUC and any refunds and credits. As such, any driver action or intervention in this regard would be minimized.

As discussed in previous chapter, a recurring issue in these scenarios is the extent to which EVs, PHEVs, and HEVs conform to the OBD-II standards. As learned during the RUCPP, conformance is quite variable. In order for the MRD to provide accurate mileage and fuel consumption information, a significant amount of reverse engineering is currently required to determine the specific pin-outs and associated information. Given that these are the types of vehicles that will be included in the initial implementation of the RUC, this effort needs to be considered as well as promotion of improved OBD-II standards.

7.3.1 In State on Public Roads

Context and Assumptions: The vehicle is driven on public roads within Oregon. The RUC account has been established with either in-vehicle telematics, an Advanced, Basic or Switchable MRD installed in the vehicle, or the High Flat Annual RUC approach (requiring no MRD) selected.

Stakeholder Activities

- None. Mileage is automatically measured, reported, and transmitted to the transaction processing and account management functions by the MRD or in-vehicle telematics. The accumulated mileage and fuel information (if available) is accumulated and charged to the RUC payer’s account. With the High Flat Annual RUC approach, no mileage reporting is required.

Issues:

- Lack of conformance to OBD-II standards by EVs and HEVs, requiring reverse engineering of the pin outs, or possibly use of one of the fallback methods.

How Scenario May Change Over Time:

- It is assumed that as RUC becomes more widespread and the number of value added services (e.g., PAYD insurance) increases, more vehicles will conform to the OBD-II standards. Moreover, more subject vehicles will provide RUC services via telematics, eliminating the concerns with the OBD-II standards.

7.3.2 In State on Private Property

Context and Assumptions: The vehicle is driven on public roads within Oregon. The RUC account has been established with either in-vehicle telematics, an Advanced, Basic or Switchable MRD installed in the vehicle, or the High Flat Annual RUC approach (requiring no MRD) selected.

Stakeholder Activities

- None. Mileage is automatically measured, reported, and transmitted to the transaction processing and account manager by the MRD or in-vehicle telematics. With the High Flat Annual RUC approach, no mileage reporting is required.
- If vehicle reports undifferentiated mileage (i.e., no location capability as chosen by the RUC payer), all mileage – including mileage on private property – is automatically measured, reported, and transmitted to the transaction processing and account manager, and the RUC payer is charged for this mileage on private roads.
 1. The RUC payer may apply to ODOT for a refund of the RUC for those miles driven on private property within 15 months after the date of payment of the charge for these miles. The application for a refund must include a signed statement by the RUC payer indicating the number of miles for which a refund is claimed and any supporting information required by ODOT.
- If vehicle is equipped with location capability (as chosen by the RUC payer) reporting differentiated mileage, and includes mapping that accurately identifies public vs. private property, no action is required. The MRD or telematics recognizes when the vehicle is located on private property and the associated mileage is not included in the RUC invoice. Moreover, specific location information (i.e., the specific roads traversed by the vehicle) is not provided to the ODOT RUCA.
- If vehicle is equipped with a Switchable approach reporting both undifferentiated and differentiated mileage, the RUC Payer has the option to “switch” to the differentiated mode of mileage reporting when driving on private property. Assuming accurate mapping, the RUC payer will not be charged for this mileage when switched to the differentiated mode.
- With the High Flat Annual RUC approach, no mileage reporting is required. The RUC payer pays the High Flat Annual RUC amount regardless of the number of miles driven on private property. There is no refund available.

Issues:

- Lack of conformance to OBD-II standards by EVs and HEVs, requiring reverse engineering of the pin outs, or possibly use of one of the fallback methods.

- Developing the application form and determining the supporting information to be provided with an application to request a RUC refund for the number of miles driven on private property.
- Accuracy of mapping with respect to differentiating between public and private property, including map updates over time. ODOT will identify a list of approved sources for electronic mapping, but will not provide maps nor certify to the overall accuracy of these maps with respect to private roads/property. CSPs must notify RUC payers of their mapping capabilities for private property

How Scenario May Change Over Time

- It is assumed that as RUC becomes more widespread and the number of value added services (e.g., PAYD insurance) increases, more vehicles will conform to the OBD-II standards. Moreover, more subject vehicles will provide RUC services via telematics, eliminating the concerns with the OBD-II standards.
- Possible enhancements in mapping accuracy with respect to public / private roads as may be driven by the marketplace to provide this function.

7.3.3 Out of State

Context and Assumptions: The vehicle is driven outside the state of Oregon. The RUC account has been established with either in-vehicle telematics, an Advanced, Basic or Switchable MRD installed in the vehicle, or the High Flat Annual RUC approach selected.

Stakeholder Activities

- None. Mileage is automatically measured, reported, and transmitted to the transaction processing and account manager by the MRD or in-vehicle telematics. With the High Flat Annual RUC approach, no mileage reporting is required.
- If vehicle reports undifferentiated mileage (no location capability as chosen by the RUC payer), all mileage – including mileage driven out of state – is automatically measured, reported, and transmitted to the transaction processing and account manager, and the RUC payer is charged for this mileage as if the vehicle was driven in Oregon.
- If vehicle is equipped with location capability (as chosen by the RUC Payer) reporting differentiated mileage, no action is required. The MRD or telematics recognizes when the vehicle is located out of state and the associated mileage is not included in the RUC invoice. Moreover, specific location information (i.e., the specific roads traversed by the vehicle) is not provided to the ODOT RUCA.
- If vehicle is equipped with a Switchable approach reporting both undifferentiated and differentiated mileage, the RUC payer has the option to “switch” to the differentiated mode of mileage reporting when driving out of state. This will ensure the associated mileage is not included on the invoice. If the MRD or telematics remains in undifferentiated mode while driving out of state, the RUC payer will be charged for this mileage.
- With the High Flat Annual RUC approach, no mileage reporting is required. The RUC Payer pays the High Flat Annual RUC amount regardless of the number of miles driven out of state.

Issues

- Lack of conformance to OBD-II standards by EVs and HEVs, requiring reverse engineering of the pin outs, or possibly use of one of the fallback methods.

How Scenario May Change Over Time:

- It is assumed that as RUC becomes more widespread and the number of values added services (e.g., PAYD insurance) increases, more vehicles will conform to the OBD-II standards. Moreover, more subject vehicles will provide RUC services via telematics, eliminating the concerns with the OBD-II standards.
- As additional states implement a (presumably compatible) RUC system and a regional clearinghouse is established, there may be cross-charging between states for differentiated mileage – that is, the owner / lessee would be charged for the miles driven in another RUC state at that state’s mileage rate (with the funds going to that state). In the case of undifferentiated mileage, all out of state mileage would continue to be charged and invoiced as if driven in Oregon.

7.3.4 Out-of-State Vehicle Driven in Oregon

Context and Assumptions: A vehicle registered in another state is driven within Oregon.

Stakeholder Activities:

- None. If vehicle is not registered in Oregon, there is no requirement to set up a RUC account and there are no RUC charges.

Issues

- None foreseen.
- If a subject vehicle registered in Oregon and with a RUC account is driven by an out-of-state driver – as often occurs with rental cars – the previous scenarios apply, with the owner / lessee of the vehicle responsible for paying any RUC charges. The rental car companies will need to determine if the RUC is included on the rental invoice (similar to what is done for electronic tolls).

How Scenario May Change Over Time

- As additional states implement a (presumably compatible) RUC system and a regional clearinghouse is established, there may be cross-charging between states for differentiated mileage – that is, the out-of-state owner / lessee would be charged for the miles driven in Oregon at Oregon’s mileage rate (with the funds going to the Oregon treasury.)

7.3.5 Obtaining Credit for Fuel Tax Paid

Context and Assumptions: The vehicle is driven using some amount of fuel (on which fuel tax was paid at the pump). The RUC system account has been established with either in-vehicle telematics, an Advanced, Basic or Switchable MRD installed in the vehicle, or the High Flat Annual RUC approach.

Stakeholder Activities:

- None. One of three scenarios occur:
 1. Fuel usage is automatically measured, reported, and transmitted to the transaction processing and account manager by the MRD or telematics, and a credit for the Oregon fuel tax paid is included on the invoice;
 2. Fuel usage is not available from the vehicle telematics / MRD, in which case the fuel used is estimated (as part of the transaction processing / account management activities)

based on the EPA combined average MPG for that specific vehicle make, model and year, and a credit for the Oregon fuel tax paid is included on the invoice;

3. The RUC payer pays the High Flat Annual RUC amount and is therefore not eligible for a fuel tax credit regardless of the amount of fuel purchased.
- With the differentiated mileage reporting approach, no fuel tax credit is provided for the mileage reported as driven out of state. The fuel tax credit is prorated based on the ratio of the mileage driven in state to the total mileage. (Of course, the RUC payer is not charged the RUC for the out of state mileage).

Issues:

- Accuracy of the fuel calculation / estimation processes. Fuel used is not an OBD-II parameter, requiring that the fuel used be estimated based on other available vehicle data, or using the EPA estimates. There were no issues during the RUCPP in this regard; but as more and different types of vehicles become subject to the RUC, it could conceivably become an issue.
- Potentially developing a process by which RUC payers can claim that their gas mileage is significantly different than the EPA values.

How Scenario May Change Over Time:

- It is assumed that vehicle telematics will become more ubiquitous in the RUC, increasing the accuracy of the fuel consumption data from vehicles.
- As additional states implement a (presumably compatible) RUC system and a regional clearinghouse is established, there may be cross-charging between states for differentiated mileage – that is, the owner / lessee would be charged for the miles driven in another RUC state at that state’s mileage rate (with the funds going to that state). A process for dividing fuel tax credits between state will need to be developed (e.g., pro rata based on mileage driven in each state), as there is currently no way of determining where the fuel was purchased.

7.4 Invoicing and Payment

Context and Assumptions: The RUC payer has chosen an account manager, has established a RUC account, and has had their vehicle equipped with technology (MRD or telematics) to automatically measure and report the number of chargeable miles traveled. The mileage collection subsystem is collecting and recording RUC mileage, estimating the amount of fuel used (as applicable), and these data and other information are being transmitted to the data collector, transaction processor, and account manager. As an alternative, the RUC payer has chosen the High Flat Annual RUC approach (requiring no MRD or other mileage reporting approach.)

Stakeholder Activities:

- If RUC payer has an account with a CSP, this private account manager sends an invoice to the RUC payer. RUC payer pays the RUC via the payment options offered by CSP (e.g. credit, debit, PayPal, check, etc.). The account manager CSP updates their database (e.g., set of accounts, accounts receivable) and sends the funds to the state treasury. The account manager CSP also sends the associated reports to the RUCA.
- If RUC payer has an account with the ODOT, the account management entity within ODOT (presumably a private entity under contract with ODOT to perform this work) sends an invoice to the RUC payer. RUC payer pays the RUC via the payment options offered by ODOT (possibly

including a cash option). ODOT updates their database (e.g., set of accounts, accounts receivable) and sends the funds to the state treasury.

- If a RUC payer chooses the High Flat Annual RUC, it is assumed that ODOT will manage the account, and will invoice the RUC payer.

Issues:

- Determine whether a cash payment option is required and if this needs to be available on Day 1. Also, identify which state agencies (e.g., DMV) will be able to accept cash for RUC; and the processes by which the received funds are transferred to the state treasury, and by which the payment information (e.g., RUC payer, account, payment amount) is provided to the RUCA.
- Invoicing intervals for the High Flat Annual RUC (e.g., annual, quarterly, monthly), and whether there is any additional carrying charge for such “installment” payments.
- Process for ODOT account management entity to assume RUC accounts – including accounts utilizing an advanced MRD – should an account management CSP be decertified or goes out of business.

How Scenario May Change Over Time:

- It is envisioned that the RUC will become more of a “commodity” and a value-added offering to other services, coupled with CSPs offering a complete “bundled” approach that also incorporates non-vehicle services (internet, cell phone.) As such, RUC pavements will be included in the payment for the bundled services, and the CSP account manager will need to “separate” the RUC-specific funds for transfer to the Oregon Treasury and to develop the various RUCA reports.

7.5 Disposal of Vehicle

The following scenarios involve the RUC payer interacting with the RUC system under a variety of different circumstances where the status of the vehicle changes, in coordination with several other entities and stakeholders.

7.5.1 RUC Payer Sells Vehicle to another Person (Private Sale)

Context and Assumptions: A RUC payer sells subject vehicle to an Oregon resident. It is assumed that the vehicle has a current RUC account in good standing.

Stakeholder Activities:

- Oregon law requires that DMV be notified within 10 days of the date of transfer when the vehicle is sold or the interest in an Oregon-titled vehicle is otherwise transferred. This can be performed online via the DMV website.
- RUC payer selling the vehicle notifies his / her account manager (CSP or ODOT) that the vehicle has been sold and that the title has been transferred. (Presumably the account manager will require some proof of this, such as a copy of the change in title. Moreover, in all likelihood, the account manager will also contact the new owner about setting up / transferring the RUC account for the subject vehicle).
- Account manager sends information to RUCA that previous owner’s account has been closed out due to sale (and if appropriate, the new owner’s name and address).

- New owner reviews choices and sets up a RUC account. This could include a simple transfer of the account name should the new owner wish to keep the mileage reporting method, account management CSP, and other account options as used by the previous owner.
- As part of the recurring data updates (e.g., new / changed registrations and titles) from DMV, RUCA identifies the name and address of the new owner of the subject vehicle and the odometer reading at the time of the sale (for auditing purposes as appropriate). RUCA determines whether new owner has set up an account; if not, RUCA sends out a reminder to the new owner.

Issues:

- Establishment (presumably by rule) of the maximum time between vehicle sale / purchase and RUC account set up by the new owner.
- If the seller used the High Flat Annual RUC approach, and the RUC is paid up through some date beyond the date of the vehicle sale, does the previous owner get a refund of this prorated amount?
- Configuration management and asset management processes – by CSPs and ODOT – for tracking MRDs, particularly if new owner chooses to use different MRD technology / MRD provider, and the MRD used by the seller needs to be returned.

How Scenario May Change Over Time:

- None foreseen

7.5.2 Vehicle Moved Out of State

Context and Assumptions: A RUC payer (and the subject vehicle) moves from Oregon to another state. It is assumed that the RUC payer had an established RUC system account in good standing.

Stakeholder Activities:

- RUC payer notifies DMV of change of address. (Oregon law requires owners to notify DMV of a change of address within 30 days). This can be done online. As part of the liaison and recurring data exchange between DMV and RUCA, new address is transferred to RUCA.
- RUC payer notifies the account manager (CSP or ODOT) regarding the change in address and closes out the account. The account manager notifies the ODOT RUCA of the address change and the account closeout. RUC payer is also responsible for sending back any MRD (if used) to the MRD provider / CSP, as presumably described in the initial agreement with the RUC payer.
- RUCA cross-checks / verifies the information received from account manager and DMV, and updates the master set of accounts.

Issues:

- Maximum time allowed following account close out for the CSP account manager to notify RUCA.
- Charging rules and processes should the RUC payer move out of state and not change their Oregon registration within the stipulated 30 days; but does cancel their RUC account with the account manager (e.g., perhaps account manager cannot close out account without proof of change in address and vehicle registration).
- Charging rules and processes should the RUC payer move out of state and change their Oregon registration; but does not cancel the RUC account via the account manager (e.g., perhaps RUCA sends the change in registration information [from DMV] to account manager to indicate the

change in status). If the RUC payer used an undifferentiated mileage reporting approach, the out of state mileage will continue to accrue and be charged; and to what extent is the RUC payer liable for these charges following their move and change in registration. (If the RUC payer used a differentiated approach, the out of state mileage will not be charged regardless).

How Scenario May Change Over Time:

- As additional states implement a (presumably compatible) RUC system and a regional clearinghouse is established, should the RUC payer move to another state with RUC, then there may be no need to cancel the account; the RUC payer can keep the same CSP and change the address and “home state” of the subject vehicle. The RUC payer will still be required to notify DMV of the change in address within the 30 day period; CSP account manager will be required to notify RUCA of the change in address (and the fact that subject vehicle is no longer in Oregon. Perhaps CSP can notify DMV of change as part of the services offered under a regional scenario.

7.5.3 Vehicle Stolen

Context and Assumptions: The subject vehicle is declared stolen, as confirmed by police report.

Stakeholder Activities:

- The RUC Payer alerts account manager, who in turn notifies RUCA.
- If vehicle is not recovered, or is recovered in a condition that it cannot be reclaimed or returned to driving condition, refer to next scenario regarding “vehicle destroyed”.

Issues:

- Assuming the vehicle is recovered and the MRD had not been disconnected, who is responsible for the mileage charge during the time it was not under the owner’s / lessee’s possession.
- Ability of the CSP to use an Advanced MRD / location-enabled telematics to help locate the vehicle.

How Scenario May Change Over Time:

- As more vehicles utilize telematics for RUC, it is envisioned that the service package will also include a stolen vehicle location and recovery feature.

7.5.4 Vehicle Destroyed

Context and Assumptions: The vehicle is declared a “total loss” by the insurer who covers the loss.

Stakeholder Activities:

- The RUC payer surrenders the title to the insurer or to DMV within 30 days of the declaration of the loss (in accordance with DMV requirements).
- RUC payer notifies account manager of the change in vehicle status. The account manager, in turn, closes the account and notifies RUCA of the change in vehicle status and account close out.
- As part of the recurring data updates from DMV, RUCA crosschecks the account close out information from the account manager with the title surrender information from DMV.

Issues:

- Extent to which insurance also covers the loss of the MRD.

How Scenario May Change Over Time:

- None foreseen

7.6 Compliance

The following scenarios address what may occur if the owner / lessee of a subject vehicle does not comply with the RUC system requirements as included in the enabling legislation.

7.6.1 Owner / Lessee Does Not Set Up and Account

Context and Assumptions: The owner / lessee of a subject vehicle (mandatory) does not establish a RUC account. The ODOT High Flat Annual RUC approach becomes the default.

Stakeholder Activities:

- As part of the recurring data updates (e.g., new / changed registrations and titles) from DMV, RUCA identifies the name and address of the new owner / lessee of the subject vehicle. RUCA determines whether new owner has set up an account; if not, RUCA sends out a reminder / notice to the new owner / lessee that they have a specified period of time to make a choice and set up the RUC account.
- After the stipulated period of time, if the owner / lessee has not set up a RUC account, the RUCA notifies the ODOT account management section to set up the default High Flat Annual RUC approach for the owner / lessee in question. ODOT account management entity sends an invoice to the RUC Payer for the annual amount.

Issues:

- The extent to which penalties and interest should be applied to the RUC payer for failing to set up the account. (HB 2453B requires ODOT to provide by rule for the collection of the road usage charges, including penalties and interest imposed.)
- Stipulated period of time between vehicle registration, RUCA notice to owner / lessee, and automatically setting up the default High Annual RUC.

How Scenario May Change Over Time:

- None foreseen

7.6.2 RUC Payer Tamper With / Removes MRD

Context Assumptions: The RUC payer creates an offense by tampering with, replacing, resetting or removing the MRD with the intent of reducing the mileage recorded by the device. This does not apply to a person who is servicing, repairing or replacing the device.

Stakeholder Activities:

- RUC payer's account manager (ODOT or CSP) and / or RUCA identifies suspicious activity (e.g., number and pattern of MRD disconnects and error codes, lack of daily mileage messages) that indicates a violation may have been committed – or perhaps instead a faulty MRD – and reports it to the ODOT RUCA office.
- Account manager (and perhaps RUCA as well) follows up with RUC payer to obtain additional information as to why disconnects / missing mileage messages have been occurring.
- Follow up enforcement activities as may be appropriate.

Issues:

- Perhaps include a requirement (e.g., policy, service provider certification guidance and requirements, and public-private partnership agreements) that require CSPs to periodically review collected data/information to identify suspicious patterns, sudden reductions in road usage, gaps in tracking data, and other types of behavior that might indicate that RUC violations are committed.
- Software to analyze the disconnect data, error codes, missing mileage information etc. to help ascertain whether the sequence of events may be a violation or a malfunction / failure.
- Defining the follow up enforcement activities (e.g., court action, placing a lien on the subject vehicle) should it be determined that RUC payer was tampering with the MRD; and who is responsible for these enforcement actions.

How Scenario May Change Over Time:

- As the number of RUC vehicles with telematics increases, the need for an external MRD decreases, as does the potential for tampering.

7.6.3 RUC Payer Does Not Pay

Context and Assumptions: The RUC payer has registered for the RUC system and established a RUC account, but fails to pay the invoice.

Stakeholder Activities:

- Account manager (CSP and ODOT) follows its own guidelines for collecting delinquent payments. After a maximum period of time, account manager notifies the RUCA of the RUC payer with delinquent payments and the outstanding amount.
- Follow up enforcement activities

Issues:

- Delinquency period before account manager notifies RUCA, and before enforcement activities commence.
- Defining the follow up enforcement activities (e.g., court action, placing a lien on the subject vehicle, penalties and fines) and who is responsible for these enforcement actions.

How Scenario May Change Over Time:

- With a regional approach (multiple states operating compatible RUC systems) the regional clearinghouse may get involved in the process, particularly if the delinquent RUC payer moves to another RUC state.

7.7 Failure Conditions

Reliability will be a key consideration in the design and development of the Basic, Advanced and Switchable MRDs, in-vehicle telematics, communications network, transaction processing, and the account management functions. This includes monitoring diagnostics to immediately identify when and where a problem has occurred and the nature of the problem. System reliability would also be addressed in the certification guidelines and specifications developed for CSPs providing RUC system hardware and services.

When failures do occur, the RUC system must continue to provide the desired functionality in some form of “degraded” mode. Potential failure scenarios and the resulting operation are noted below:

-
- **Loss of communications between MRD and transaction processing/account management functions (either ODOT or CSP)** – RUC system communications are not continuous, but occur on an as-needed basis (with a message sent at least once every day, even if no mileage is recorded.) The communications design for the MRD would also incorporate several alternatives allowing the MRD to communicate with whatever network is available depending on the vehicle location. If data transmissions were attempted and the communications network was to be down, the MRD would continue to re-try until the transmission was successfully completed. The MRD would continue to collect and buffer mileage and other data until it could be transmitted.
 - **Failure at transaction processing/account management functions** – Failures could include power interruption, physical disaster (natural or otherwise), or software issues. Requirements (e.g., uninterruptable power supply and a backup power source, backup server location, cloud computing) should be included in the certification guidelines and specifications developed for service providers.
 - **Defective MRD** – The MRD requirements include self-monitoring technology, including the ability to send a variety of error messages to the data collector / transaction processor / account manager. Account manager will notify the RUC payer of the error, and the RUC payer is responsible for replacing the MRD (if the account manager has not already sent a replacement). An issue – how to account for any missing data during the period of MRD failure; perhaps prorating the RUC charge based on the number of days that mileage was missing and the average previous use (e.g., say the vehicle averages 1,200 chargeable miles per month; a 5-day gap in data would result in a pro-rata charge for 200 miles); or an individual audit if the period of missing data is greater than some stipulated number of days
 - **Loss of Advanced MRD location capability** – The MRD functionality would still continue to record mileage using vehicle data in an undifferentiated mode.