



EFFICIENT ADMINISTRATION OF RUC

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Preface

Hawaii pays for the repair and upkeep of its state roads and bridges from taxes and fees on highway users. Funding sources for this repair and upkeep include vehicle registration fees, weight taxes, rental car surcharges, and motor fuel taxes. Historically, motor fuel taxes have generated the largest share of money for state roads and bridges. At 16 cents per gallon on gasoline and diesel, motor fuel taxes are the only revenue source based on how much drivers use the road network. Hawaii's counties also tax fuel in order to pay for county roads, at rates that vary from 16.5 to 23 cents per gallon. Additionally, the Federal government funds the Highway Trust Fund using a federal tax of 18.4 cents per gallon of gasoline, and 24.4 cents per gallon of diesel.

As Hawaii residents purchase new cars that consume either less fuel, or none at all, the amount of county, state, and federal funding available for roads in Hawaii from the fuel tax is declining. Moreover, the historical link between how much people drive, and how much they pay to use the roads, is fading. Although declining motor fuel consumption is a welcome trend for meeting energy and environmental goals, the Hawaii Department of Transportation (HDOT) has identified it as a risk to the sustainable and equitable funding of its roads and bridges.

In 2016, HDOT commissioned a feasibility study of transitioning from taxation of fuels to taxation of miles driven as the basis for road funding. The study concluded that a per-mile road usage charge (RUC) is feasible for Hawaii, but that several major issues must first be addressed.

RUC is a concept where roads are funded by charging vehicle owners an amount based on how much they use those roads. However, there are many details to consider before RUC can be enacted into law or implemented into practice.

In 2017, HDOT secured federal funding to perform more in-depth research into RUC. From 2018-2019, HDOT conducted this research which included a statewide telephone survey of residents, holding a series of focus groups, hosting 13 public meetings across all six islands, broadcasting an online virtual public meeting, as well as meeting with dozens of stakeholders (including county officials, neighborhood boards, civic groups, environmental organizations, chambers of commerce, etc.). Building on the earlier feasibility study, this “discovery” phase of RUC research revealed several community concerns regarding the potential transition from the “taxing of fuel” model to a “fee based on miles driven” model.

HDOT and its team of Hawaii Road Usage Charge (HiRUC) researchers reviewed these concerns carefully in order to fully understand their meaning, origin, and degree of urgency. Broadly speaking, the concerns fall into three categories:

- ▶ Often, public **perceptions** are expressed as concerns. For example, some members of the public believe that a RUC system will unfairly burden rural residents. To address perception-based concerns, HDOT conducted research to determine whether there was a factual basis for these assertions and if so, what approaches exist to address these claims through policy or system design adjustments.
- ▶ The operational **challenges** that a RUC system will face are also often identified as concerns. For example, some stakeholders and members of the public worry that a RUC system would be costly to administer, as compared to the current system of fuel taxation. To address these operational and technical challenges, HDOT conducted research to better understand and improve the RUC system design.

- ▶ Sometimes, a policy **choice** is expressed as a concern. Lawmakers and system designers will have to make many choices when creating a RUC program. For example, they must choose a rate, which can be a simple flat rate per mile for all cars, or can vary based on the type of vehicle. Some members of the public would prefer a RUC system that incorporates vehicle weight, or vehicle emissions, as a factor in the rate. HDOT conducted research into the various policy choices available, as well as the relative impacts, strengths, and weaknesses of each approach.

Given the varying concerns and topics they span, HDOT decided to organize further research into these topic areas. For each topic area, a “policy paper” was initiated to summarize the nature of the concern (or concerns) within the topic area, the results of research, the analysis into the concerns, as well as the implications of the research on RUC policy or system design.

The purpose of these policy papers is not to contain recommendations or clear answers on what precisely HDOT or the Legislature should do. The purpose of each policy paper is to provide adequate background and analysis to support decision-making by lawmakers and system designers as they contemplate the enactment of a RUC system.

Executive Summary

Road usage charging (RUC) is a revenue concept that involves assessing vehicles based on the distance driven on the public road network. As with any new revenue mechanism, RUC requires new information, systems, and processes, impacting customers and agencies alike. Commonly raised by the public and stakeholders during the early outreach stages of the HiRUC project was a preference that a new RUC system be designed and administered cost-effectively.

With only three active light-duty vehicle RUC programs worldwide (Oregon, Utah, and New Zealand), experience with operating such systems is limited. New Zealand's program offers the greatest depth of experience, with a RUC program that dates to the 1970s for light-duty diesel vehicles. The country also most closely resembles Hawaii in that it is an island jurisdiction with annual vehicle inspections. Across these three programs, several key lessons learned emerge:

- ▶ Using manual mileage reporting as a foundation for RUC can reduce costs.
- ▶ The private sector is more effective at developing and improving technology than the public sector.
- ▶ Pre-payment of RUC simplifies program administration.
- ▶ Aligning incentives between the agency collecting and using funds can minimize costs.
- ▶ Starting with a small-scale RUC program allows the administering agencies to set up systems, collect revenue, and interact with customers in a relatively low-risk, low-stakes way.
- ▶ Regular evaluation leads to continuous improvement.

Designing a RUC system requires policymakers to make policy choices and executing agencies to make program design choices. These choices, in turn, impact costs. Policy choices that impact costs most significantly include setting rates, designating subject vehicles, selecting an agency to administer the program, prescribing mileage reporting methods, specifying the terms for private sector involvement, charting a transition pathway for the program, and evaluating and reporting on program performance. This paper reviews the range of choices available and the implications on system cost. For example, prescribing low-cost mileage reporting methods like vehicle inspection-based RUC can reduce costs significantly, while inviting private sector involvement in the event of prescribing technology-based mileage reporting methods can help control the costs of such features.

System design choices also impact costs. For example, the administering agency must design an approach for accepting payments from customers. Credit and debit cards carry merchant fees, while checks require processing and inevitably involve some portion of overdrawn accounts, which require additional customer attention. Allowing frequent installment payments also requires additional customer support and higher transaction costs. These and many other detailed design choices are memorialized in system design documentation which are best compiled with costs as a deliberate trade-off to consider. Contracts with private sector suppliers of components of a RUC system are another opportunity for system design choices to impact costs, along with the conduct of periodic program evaluations.

Definitions & Abbreviations

TERM/ABBREVIATION	DEFINITION/DESCRIPTION	REMARKS
CAM	Commercial Account Manager	
ConOps	Concept of Operations	
DIT	City and County of Honolulu Department of Information Technology	
DMV	Department of Motor Vehicles	
DOTAX	Hawaii Department of Taxation	
EPA	Environmental Protection Agency	
EV	Electric Vehicle	
HDOT	Hawaii Department of Transportation	
HiRUC	Hawaii Road Usage Charge	
ICD	Interface Control Document	
MPG	Miles Per Gallon	
OBD-II	On-board Diagnostic Port	
ODOT	Oregon Department of Transportation	
PMVI	Periodic Motor Vehicle Inspection	
RUC	Road Usage Charge	
SRS	System Requirements Specification	
UDOT	Utah Department of Transportation	
U.S.	United States	

1. Introduction

Among the classical principles of tax policy is the ability to administer tax and fee collection mechanisms efficiently. When the purpose of a tax or fee is to generate revenue, then high costs of collection and administration undermine the purpose. Formalized by Adam Smith in *Wealth of Nations* in the 18th century, this principle remains a central feature of tax policy guidance in the 21st century, even as other principles have evolved over time.¹

Hawaii, like other states, derives transportation funding primarily from user taxes on fuel consumption and vehicle ownership. Fuel taxation is one of the most efficient methods for governments to collect revenue, estimated by state departments of transportation (DOTs) nationally to cost less than 1% of revenue.² Outside analysis estimates the cost closer to 5% when factoring in evasion and administrative costs not typically considered by DOTs.³ In Hawaii, as in most states, the Department of Taxation collects fuel taxes from fuel distributors when fuel is removed from storage tanks and placed into tankers for delivery to retail fueling stations. Collecting at this point of the fuel supply chain reduces the number of taxpayers. Instead of collecting the tax directly from millions of drivers or even from hundreds of retail fuel stations, collecting from distributors means, in most states, the number of taxpayers is in the dozens or hundreds. In Hawaii fuel distributors number fewer than 30. Collecting from such a small number of taxpayers allows for low cost of tax administration by the agency.

Vehicle registration fees and weight taxes, by contrast, are collected from individual vehicle owners. In Hawaii, the various county Departments of Motor Vehicles (DMVs) are responsible for licensing vehicles and collecting fees on behalf of the state and the counties, with IT support by the City & County of Honolulu Department of Information Technology (DIT). With over 1 million vehicles registered in Hawaii, the DMVs collectively administer hundreds of thousands of transactions with vehicle owners per year for titling, registration fees, weight taxes, and other miscellaneous fees and taxes. Although no precise, comprehensive cost estimates are available, City & County of Honolulu budgets close to \$19 million in operating costs per year for Motor Vehicle, Licensing, and Permits, or \$24 per vehicle, which represents between 5 and 10 percent of state and county vehicle-related taxes and fees collected on Oahu.⁴

As states examine the possibility of transitioning from fuel taxes to a per-mile road usage charge (RUC), an important component of this transition is to understand and control the prospective costs of RUC administration, the factors that drive those costs, and choices available for keeping costs reasonable. Public outreach and stakeholder consultations conducted by the Hawaii Department of Transportation (HDOT) for the Hawaii Road Usage Charge (HiRUC) Demonstration project revealed a common perception among the public and stakeholders alike, including county and state agencies, that RUC would be costly to implement and administer. Given the wide range of possible configurations of a RUC system, the range of administrative costs could likewise be wide. Understanding the relationship between the choices available for a RUC system and their cost impacts can help guide policymakers and system administrators toward a RUC solution that yields revenue at reasonable cost of collection.

¹ Association of International Certified Professional Accountants (AICPA), *Guiding principles of good tax policy: A framework for evaluation tax proposals*, 2017.

² U.S. Federal Highway Administration, *Highway Statistics*, Table MF-3, 2020.

³ Reason Foundation, *Dispelling the Myths: Toll and Fuel Tax Collection Costs in the 21st Century*, 2012.

⁴ City & County of Honolulu, *FY2022 Adopted Operating Budget (Ord 21-20)*, 2021.

This paper begins with lessons learned from other jurisdictions that have implemented RUC systems for light-duty vehicles regarding efficient administration. Next, the policy and system design choices that impact RUC administrative costs are reviewed and analyzed. Examples of choices include determining which vehicles pay RUC and selecting mileage reporting methods. Some of these choices can be made by policy makers and put into enabling law for a RUC program, while other choices can be delegated for the implementing agency. The paper concludes with an explanation of next steps, including a summary of how RUC cost factors will feature alongside a more complete summary of administrative issues.

2. Lessons Learned from Other RUC Programs

Despite extensive experimentation and pilot testing with RUC systems in the U.S., there is limited experience with permanently operational RUC programs globally for light-duty vehicles. Those with the most instructive lessons for Hawaii are New Zealand, Oregon, and Utah.

2.1. New Zealand RUC Program

In 1978, New Zealand introduced RUC primarily to achieve more efficient recovery of road costs from heavy vehicles, while simultaneously abolishing diesel taxes. RUC was introduced as a weight- and distance-based charged. Vehicle owners purchase prepaid licenses based on the wheel-axle configuration of their subject vehicles. With the initial focus on heavy vehicles, the payment, measurement and enforcement system was developed to meet their needs, including the requirement for vehicles to install hub-odometers on all tractor and trailer units. Light-duty vehicles were only subject to RUC if powered by a fuel not taxed at source (i.e., diesel cars). By the mid-1990s, the majority of vehicles subject to RUC were light (under 3.5 tons). Today over 800,000 vehicles subject to RUC are light-duty diesel cars. Electric cars are currently exempt from paying RUC, but the exemption will expire in March 2024.

The prevalence of light-duty vehicles presented a challenge to the RUC program in the 1990s. Owners of light-duty diesel vehicles were far less likely to be aware of the requirement to pay RUC than heavy vehicle owners, which tended to be large fleets and businesses. The requirement on light-duty diesel vehicles to pay RUC is based on prepaying distance in blocks of 1,000 km. The distance is purchased in the form of a paper license displayed in the windshield showing the odometer reading range that the license covers. The odometer of the car must be between the range displayed on the license. Recently, New Zealand updated the enforcement of this requirement to include checking the odometer at vehicles' annual safety inspection (warrant of fitness).

In the early 2000s, the New Zealand government began to certify private telematics companies to serve as agents on behalf of vehicle owners to measure and pay RUC. The primary market for this service is heavy vehicle fleets, for whom commercial fleet management and tracking services are worth the cost of monthly subscriptions. Rather than developing a government telematics platform or contracting with one supplier, the New Zealand government opened the market to any company who could meet the standards for accurate distance and weight measurement, data security, and financial strength.

Today New Zealand's RUC program collects over \$1 billion annually for the land transport fund to invest in the nation's roads and bridges, at a cost to the New Zealand Transport Agency of less than 2% of revenue. The cost of the transactions is passed on to consumers in the form of administration fees that range from approximately US \$1.50 per transaction for purchases made through "direct connect" agents to US \$5.50 for phone transactions. RUC purchased online incurs an administrative fee of approximately US \$3.00. Close to half of heavy vehicles opt for a commercial telematics provider, while most light-duty vehicles continue to purchase paper RUC distance licenses, subject to verification at annual safety checks. Whether paper licenses or commercial providers, customers must cover some of the costs of license transactions. Paper license purchases include fees to cover the cost of printing and transacting, while commercial suppliers of telematics that include RUC reporting, payment, and recordkeeping functionality all operate under a SaaS subscription model whereby fleets pay for a bundle of services which includes RUC.

2.2. Oregon's OReGO RUC Program

Absent an annual safety check like New Zealand, Oregon began its light-duty RUC program by exploring technology options for reporting miles driven. Following a successful pilot test in 2012-2013, the Oregon Legislature enacted the permanent OReGO program in 2013. The legislation directed the Oregon Department of Transportation (ODOT) to structure the program as a public-private partnership, with multiple options for mileage reporting and account management and at least one method of mileage reporting that does not require vehicle owners to surrender any location data.

In building a program to align with legislative direction, ODOT invited any firm in the market to participate in the provision of RUC services. The agency evaluated proposals from numerous bidders and, based on the responses, created a “market contract” that dictated the overarching requirements for a RUC account manager to be qualified to provide RUC services to Oregon drivers and set forth the terms of compensation. Because the OReGO program was, and remains, small, with an initial cap of 5,000 vehicles, ODOT decided to compensate qualified vendors by allowing them to keep 40% of the revenue they collected. Although this figure is too high for a larger-scale program, ODOT fixed the fees at this level to encourage market participation while establishing a small-scale program for future growth.

During the first six years of OReGO operations, ODOT has continued to experiment with RUC features. There are currently two market-based commercial account managers (CAMs) which operate accounts for ODOT, including one that does so on a pre-payment “wallet” basis, and another that does so on a post-payment basis. Both CAMs are liable to pay ODOT for all miles driven by their customers, regardless of whether they are able to collect from their customers. If a customer fails to pay, the current enforcement model in the volunteer system is straightforward: customers are removed from the program and revert to paying the electric and high-mpg vehicle registration surcharge of up to \$110 per year. ODOT has recently indicated it will explore offering a manual payment option based on odometer self-reporting, in part to reduce costs.

2.3. Utah's Road Usage Charge Program

Utah was the second state to launch a RUC program after Oregon. Legislation in 2018 directed the Utah Department of Transportation (UDOT) to establish a RUC program for electric, plug-in hybrid, and hybrid vehicles by January 1, 2020. Those vehicles can choose to pay a vehicle registration surcharge, which varies by vehicle type, or to pay by the mile. Electric vehicles pay either \$120 per year or 1.5 cents per mile in RUC. The RUC is capped at \$120 so vehicle owners cannot pay more than they would pay in flat fees.

Given the compressed time frame available to launch a program, UDOT opted to conduct a traditional procurement and hired a vendor to operate the entire system. However, the technical features of the program are very similar to Oregon's program, as UDOT studied and borrowed extensively from Oregon, making a few modifications to tailor the program to Utah's legislative requirements and other preferences of the agency.

In the nearly two years since Utah's program launch nearly 4,000 vehicles have enrolled, reporting mileage via plug-in devices that wirelessly transmit mileage totals to a transactions processor, or by unlocking their existing vehicle telematics provider to periodically send odometer data to the account processors. Utah's system relies on a “wallet” approach similar to one of Oregon's account managers. Under this approach, customers load funds into an account. The funds are deducted as they drive, and when the balance gets low, their credit or debit card on file is automatically charged to add funds to the account. This acts as a pre-payment approach, not dissimilar in concept to New Zealand's pre-paid distance license approach.

2.4. Key Lessons Regarding Efficient Administration

Based on the experiences of New Zealand, Oregon, and Utah to date, several lessons stand out that relate to efficient administration.

- ▶ Using manual mileage reporting as a foundation for RUC can reduce costs. New Zealand's mature RUC system relies on purchase of distance licenses enforced via odometer inspection at annual safety checks, not unlike the approach HDOT designed for the HiRUC Demonstration's first phase. As other states in the U.S. are discovering, including Oregon, using a manual approach as a foundation for a starter RUC program, is a low-cost way to build the necessary systems and begin revenue collections.
- ▶ The private sector develops and improves technology regularly. In none of the RUC programs to date has an agency attempted to develop or implement any new technology for mileage reporting, account management, or technical customer service. In each case, agencies leveraged the private market for expertise, technology, and systems, in the case of New Zealand at zero cost to the government. Although Oregon has adopted a similar model as New Zealand, the market size remains small, so the state must incentivize market participation. Utah likewise has not yet opened the market to other providers, given the small number of participating vehicles. In the long term, this model for RUC for light-duty vehicles can yield tremendous cost savings for agencies looking to deploy technology-based methods of mileage reporting.
- ▶ Pre-payment of RUC simplifies program administration. It reduces the likelihood of evasion and level of enforcement needed. It provides cash flow to the agency. It reduces transaction costs by eliminating the need for invoicing and reminders for unpaid accounts. However, some systems, including DMV systems, may not be configured to accept pre-payment, and the notion of pre-paying for RUC may be politically less acceptable than post-payment. However, the gas tax is a pre-payment model: vehicle owners pay the tax before they expend the fuel to drive on the roads. This analogy can make pre-payment more acceptable for RUC, especially since one of its policy purposes is to replace the gas tax.
- ▶ Aligning incentives between the agency collecting and using funds can minimize costs. As existing RUC programs have shown, alignment between the agency collecting funds and the agency benefitting from collection of funds can ensure the right incentives are in place for minimizing cost of administration. For example, both Oregon and Utah DOTs are responsible for collecting RUC and both agencies receive RUC funds through the highway fund. Likewise the New Zealand RUC is collected by the Transport Agency which operates and maintains the national highway network. HDOT and county DMVs alike will either directly or indirectly receive RUC funds.
- ▶ Starting with a small-scale RUC program allows the administering agencies to set up systems, collect revenue, and interact with customers in a relatively low-risk, low-stakes way. As New Zealand, Oregon, and Utah have all shown, gradual transitions are more practical. But they are also less costly. The fuel tax remains the most efficient transportation tax in the country and in Hawaii. Relying on the fuel tax for the majority of the vehicle fleet, which will continue to burn fuel for at least another decade, will allow the state to ensure that the RUC system is as cost-effective as possible, allow time to establish rules, build and test processes and systems, train staff, grow familiarity with customers and communications they need to comply, before transitioning large-scale revenue collections to it.

- ▶ Regular evaluation leads to continuous improvement. Policymaking and system design are not complete once an initial RUC program is put in place. Regular reporting on performance and objective evaluation of performance factors are essential to continuous improvement and cost reduction. Critical analysis of the processes, the system, and the environment can increase revenue and decrease costs over time.

The next section explores specific elements of policy and system design and their directional impacts of overall RUC administration costs.

3. RUC Policy and System Design Choices Affecting Cost of Administration

RUC is the concept of collecting revenue based on distance traveled. Converting that concept into reality requires making a series of policy and system design choices. Based on the number of decisions to make and the choices and combinations available, in practice RUC could take thousands of distinct forms, and each of these forms has an associated cost. Therefore, it is not possible to estimate the cost of RUC based on the concept alone. It requires understanding the decisions to make, analyzing the choices available for each decision, and making choices.

The choices available fall into two broad categories: policy and system design. Policy choices are those made by policymakers when writing statute that creates a RUC program in law. System design choices are the more detailed choices made by agencies in the executive branch through the course of executing the law. There are few preordained rules or guidelines about which choices can or must be made in law versus which can or must be made through system design. Some legislatures provide broad discretion to executive agencies to make choices in the execution of laws, while others provide more prescriptive guidance.

The two sections that follow present choices as “policy” choices or “system design” choices. However, it is not necessarily the case that all policy choices must be made by the legislature, nor is it the case that all system design choices must be made by executive agencies implementing a law. Perhaps the only guideline is that, in crafting tax policy, the legislature must establish a rate or rate structure in law. Almost all other decisions can theoretically be left to executive agencies. In practice, though, many decisions fall to the legislature to negotiate to ensure public acceptance of the final product as well as reasonable guidance to the executive branch.

3.1. RUC Policy Choices Impacting Cost of Administration

This section reviews the major policy choices that lawmakers will likely confront in writing a law to authorize the creation of a RUC program initially. Each section describes the directional impacts that various choices have on system costs.

One program element that impacts costs is enforcement. A separate policy paper Compliance and Enforcement of a Road Usage Charge in Hawaii addresses options for enforcement of RUC in greater detail.

3.1.1. Rate Setting

Rate setting is a policy choice with many impacts to consider such as differential impacts on population groups by geography and demographics, total net revenue, and ability to keep pace with costs.

Rate setting also impacts cost of administration in several ways. First, rate setting determines total revenue, which serves as the denominator for the popular but often misleading “cost as a percent of revenue” metric. The lower the raw cost, the lower the cost as a percent of revenue. Likewise, the higher the revenue, the lower the cost as a percent of revenue. Raising the rate of a RUC automatically reduces the cost as a percent of revenue. Because of the high variability in revenue targets and rates across tax and fee mechanisms, and across geographics, using this metric must be done cautiously.

Secondly, the type of rate setting impacts the complexity of the accounting system used to assess RUC charges. For example, the simplest possible configuration is to set a flat rate per mile for all miles driven. Assessing this type of charge requires one number per vehicle per reporting period: the number of miles driven. As with the weight tax, one charge rate is multiplied by one number (miles driven) to produce the charges due. More complex rate structures could require or allow charging miles differently by location driven, which necessarily requires or allows for measuring miles by location, which increases the cost of mileage measurement technology.

Third, rate structures that introduce complexity often require additional customer service to explain, including additional upfront information presented in numerous formats to allow for ease of understanding and increased likelihood of initial compliance. Variable rates by vehicle type, for example, may invite customer inquiries about their individual circumstances. In the HiRUC Demonstration, one of the most commented features of the Driving Report was the vehicle's fuel economy rating, derived from the U.S. Environmental Protection Agency. Since fuel economy, measured in miles per gallon (MPG), varies by an individual's circumstances including fuel type, operating circumstances, and driving style, using a single MPG measure for each vehicle make, model, and year combination drew attention and concern from many drivers who questioned its applicability to their particular circumstance.

3.1.2. Subject Vehicles

Administering a RUC program requires, at minimum, a live connection to the state vehicle registry. The level of operational involvement by the same entities (DMVs) that interact with customers for vehicle registration varies from state to state. This means that the ability to apply RUC to specific types of vehicles depends on the ability of the system to identify vehicles by category. For example, in Utah and Oregon RUC is available as an alternative to a registration surcharge for electric, hybrid, and plug-in hybrid vehicles. In Oregon and Virginia, it is also available to all vehicles above a certain MPG (20 and 25, respectively).

At the same time, the ability to assess RUC depends on the ability of subject vehicles to comply at low cost. Vehicles manufactured prior to 1996 do not have an onboard diagnostic (OBD-II) port, which eliminates the possibility of using plug-in devices to report miles driven for those vehicles. Although onboard telematics are becoming more widely available, most vehicles on the road, including some vehicles manufactured today, do not have the capability, rendering that prospective method of mileage reporting inaccessible for most vehicles. Should Hawaii rely on odometer reporting, some older vehicles have inoperable odometers and/or mechanical odometers for which evasion via odometer rollback is plausible.

Based on DIT's existing vehicle registry, it should be straightforward to identify vehicles by the following relevant factors for RUC: age, fuel type (i.e., DIT must already identify electric vehicles for the electric vehicle surcharge), and weight (i.e., HiRUC focused on vehicles below 10,000 pounds). Using additional factors like MPG or engine size to identify vehicles subject to RUC would require additional cost and effort to identify and apply the RUC to the correct vehicles.

3.1.3. Authorized Agency

The choice of executive agency or agencies authorized to collect RUC is a fundamental element of any enabling RUC law. Both Oregon and Utah authorized their respective state DOTs to administer the program. Virginia authorized the state DMV.

In Hawaii, although the state's Department of Taxation (DOTAX) collects fuel taxes, the counties' DMVs collect vehicle-related fees. DOTAX collects both state and county fuel taxes, and remits the county

portion to the respective counties. County DMVs, in return collect both state and county vehicle-related fees, and remit the state's portion to the state. A more complete HiRUC organizational assessment report will cover the full range of considerations in deciding an authorized agency as a separate appendix to the *HiRUC Final Report*. However, for purposes of understanding cost impacts, several factors are key.

First, a best practice from other jurisdictions is to align the incentives of the agency or agencies collecting the tax or fee and the agency or agencies using the funds. For example, in Utah, New Zealand, and Oregon, the agency collecting the RUC is the one who benefits from the net revenue for purposes of investing in the agency's mission. This alignment creates a natural incentive for the agency to administer the revenue mechanism in as efficient a manner as possible, to maximize yield. In Hawaii, although HDOT stands to benefit from the sustainable, equitable revenue that a RUC could produce, counties likewise would benefit from such a revenue mechanism, given the current reliance on county gas taxes for the majority of each county's road fund.

Secondly, it is important for the authorized agency to have subject matter knowledge of RUC, or at least of the elements of a RUC system. Any agency with a revenue collection function, especially one that touches individual consumers and residents, like DOTAX (income tax) and the county DMVs (vehicle registration) will have most of the existing knowledge and skills for administration of a tax program. What lacks, however, is the ability to collect miles driven data, the essential additional component for calculating and assessing a RUC. HDOT has that data through the Periodic Motor Vehicle Inspection (PMVI) program, and/or the data could be collected via additional means as explored in the HiRUC Demonstration.

The ability of the authorized agency to work effectively with DIT for access to the vehicle registry and with HDOT for access to the odometer mileage data contained in the PMVI system is a critical factor for reducing operational costs. In addition to accessing data from both systems, the RUC system might potentially need to integrate with third party technology suppliers. To administer such a program at reasonable costs requires the agencies to collaborate and share data in an efficient manner. Selecting an authorized agency or agencies in legislation, prescribing roles for each agency, and authorizing funds for each agency, can help to remove ambiguity and improve the efficiency of the overall administration.

3.1.4. Mileage Reporting Methods

No RUC legislation to date has prescribed specific mileage reporting methods. Each has, however, delegated the selection of mileage reporting methods to the authorized agency, along with required features of the methods chosen. Oregon, for example, requires the agency, ODOT, to offer at least one method of mileage reporting that does not require the consumer to provide any location data.

The range of costs associated with mileage reporting methods is wide, from zero marginal cost for odometer mileage data already collected through HDOT's PMVI program to as little as \$1 or less for self-reporting or odometer image reporting to perhaps \$5-10 per month for automated reporting with in-vehicle technology. The *HiRUC Cost of Collection Report* explores the factors that drive cost of mileage data collection, particularly the vehicle-inspection method contemplated in Hawaii. But, the bottom line is that integrating miles-driven data from PMVI into the vehicle registration process is the only function missing to allow Hawaii to create a fully-functioning RUC program.

Over-prescription of mileage reporting methods in law can constrain agencies in their ability to find and deploy optimal technologies and systems for collecting miles driven data. On the other hand, failure to prescribe any mileage reporting technology or method features can leave the agency untethered to legislative expectations regarding cost of collection. Given the prospects for low-cost mileage reporting

via the existing PMVI program, enabling law could prescribe such a mileage reporting method as the baseline requirement for all vehicles. Such an approach would likely lead to very low cost of collecting RUC in Hawaii. The law could also allow vehicle owners to opt to report miles in a different manner, at their own election, subject to requirements created by the authorized agency or agencies. Prescribing additional methods beyond PMVI in law could preempt the ability of agencies to evolve quickly as vehicle technology and payment systems improve.

3.1.5. Commercial Model for Private Sector Involvement

Hawaii is reasonably positioned to initiate a low-cost RUC revenue mechanism by leveraging the existing PMVI and DIT programs and integrating the necessary data elements to put a small, starter program in place. One or more agencies involved may benefit from provision of certain services by the private sector. For example, PMVI contracts the information technology for collecting and storing inspection data to a private contractor.

Should the state desire to offer more than just the vehicle-inspection method of mileage reporting or odometer image capture, the cost of the program will increase. With the current suite of available, viable methods of mileage reporting, all come with substantial costs, especially those that require location for differentiating miles driven by jurisdiction or road type. Policymakers can help manage the near-term and long-term costs of offering these other methods of mileage reporting in several ways.

First, as New Zealand has demonstrated and Oregon has replicated, creating an open market for provision of mileage reporting technology and account management services can reduce costs. In an open market, any company who qualifies can provide RUC services to vehicle owners who prefer to report miles and pay using a method other than the basic method offered by the state (e.g., in the case of Hawaii, the PMVI method). RUC service providers effectively compete for the provision of service to end consumers in a manner similar to competition among auto insurers for provision of a regulatorily-required function. An open market also allows service providers to share some of the costs of RUC-related functions with other commercial functions they supply. For example, if an entity collects mileage data from its customers for other purposes, the marginal cost of doing so as part of the provision of RUC services is effectively zero.

In addition to an open market model, policymakers could allow service and technology providers to recover some or all their costs directly from customers who opt for their services. For example, customers could opt in for subscription-based services such as vehicle health monitoring, crash alerts, and other applications that rely on the same infrastructure and data as RUC. Covering the costs of RUC functions through commercial services shifts the cost of more sophisticated methods of mileage reporting and RUC account management from the agency to the customer, at the customer's election. In New Zealand, the *entire* cost of reporting is borne by the customer, which allows the agency to administer the RUC program at below 2% of revenue.

- ▶ Finally, coordinating with other states to standardize data exchange interfaces and technology specifications can further keep costs down, as was done with the HiRUC Demonstration phase two, where the specifications were based on the OreGo RUC certification standards with minor modifications for Hawaii. Open and standardized specifications enables the leveraging of existing industry knowledge and techniques leading to faster and more reliable deployments. The use of open standards encourages market competition over time, allowing Hawaii to partake of the cost reductions that are sure to ensue as additional states begin deploying RUC system and the volume of RUC transactions increases.

3.1.6. Transition

No RUC program for light-duty vehicles covers all vehicles in a jurisdiction. The world's largest, most mature program in New Zealand has gradually grown to 800,000 diesel cars over a period of decades. Meanwhile, Utah and Oregon continue to study alternatives for transitioning their current small-scale programs from electric and high-MPG vehicles to more vehicles. The transition from a small-scale start-up program to a larger-scale program is one every state with a RUC program will face.

The choice of how to transition, as laid out in the *Approaches for Removing the Fuel Tax* policy paper, will affect program costs. A gradual transition allows for a small-scale program to learn, establish rules, build and test processes and systems, train staff, and grow familiarity with customers and the communications they need to comply in the most cost-effective manner. Sudden transitions that require agencies to scale programs to handle large numbers of vehicles risk high costs, revenue losses, and public relations incidents whereas gradual transitions can manage risks more effectively.

3.1.7. Evaluation and Reporting

A key success factor for the cost reduction of New Zealand's mature RUC system has been regular external program evaluation and reporting. Following enactment of parliamentary reforms to the RUC program in 2008, the RUC program underwent a "three-cycle" evaluation examining customer satisfaction, program awareness, compliance and evasion, enforcement practices, and cost-effectiveness, among other features. The evaluation resulted in a number of recommended refinements and improvements to the program which were subsequently enacted to enhance the RUC program, making it easier for customers to comply, simpler for RUC service providers to enter the market, and less costly for the administering agency to operate.

Oregon, likewise, has conducted regular evaluation of its small-scale RUC program as a prelude to larger-scale adoption, identifying improvements in account manager certification processes, customer service, communications, mileage reporting technologies, and detailed system design features. These improvements position the administering agency, ODOT, for successful expansion of the program at relatively lower costs should the legislature enact a mandatory RUC for more vehicles in the state.

Lawmakers can codify the requirement to regularly report progress on the RUC program and conduct external evaluations, especially in the early years of program operations. The evaluation and reporting process ensures not only self-accountability by the administering agency, but also provides critical information in a feedback loop to policymakers in the event legal changes can help the program to function more effectively.

3.2. RUC system Design and Administration Choices Impacting Costs

The legislature has the prerogative to specify any detail of RUC system design or administration, but typically additional choices beyond those discussed in Section 3.1 are left for executive agencies to decide and implement. The level of detail in choice-making extends to detailed system specifications, business rules, and technology requirements. This section discusses the main categories in which these decisions are made, rather than the detailed decisions themselves, and the directional impacts on costs.

3.2.1. Payment Details

Given that a RUC system requires payment by or on behalf of individual motorists for road usage, it will require transactions for as many as the 1.4 million vehicles registered in Hawaii, although an early small-scale start-up system is likely only to begin with thousands of vehicles. Nevertheless, the administering agency must decide how to receive payment from customers. This includes payment

frequency (e.g., annually, semiannually, quarterly), payment methods (e.g., credit card, debit card, check, cash), and channels (e.g., in person, online, via telephone, by mail). Despite the prospect of outsourcing RUC account management and payments to the private sector in a long-term future for certain methods of mileage reporting, it is likely that Hawaii's PMVI-based method of mileage reporting will require fee collection directly by a state agency or by county DMVs. After all, PMVI-based reporting proved by far the most popular in the HiRUC Demonstration, even among participants in the Technology Test Drive portion of the HiRUC Demonstration.

Each transaction incurs several costs for the administering agency. First, there is the cost of the financial transaction itself for each payment method. Credit and debit cards come with merchant fees, while checks require processing equipment, and cash requires cash handling procedures and facilities. Regardless of payment method, many customers will require support from a customer service agent, in person or over the phone, to complete the transaction. Some customers may be able to complete the transaction online. The lowest-cost method of transaction funds is via bank transfer, but many customers prefer credit and debit cards in order not to share sensitive bank information with public agencies.

Next, payment channels come with varying degrees of cost. By far the most costly is support for in-person payments. By leveraging existing DMV locations and bundling RUC payments with other vehicle-related payments such as registration renewal (alongside weight taxes and registration fees), the state could minimize additional costs. However, the value of each transaction would be larger, leading to higher transaction costs (which are a function of the size of the transaction) and potentially customer dissatisfaction and complaints around the issue of ability to pay. Online transactions are the lowest-cost for the state to administer, but they require development and maintenance of simple, user-friendly interfaces and are only available to customers with credit cards, debit cards, and/or bank accounts.

Offering more frequent payment options multiplies the transaction cost. If one charge can be broken into four payments, the additional cost of the transaction is much larger, although not necessarily quadruple the cost. The financial transaction remains a percentage of the value of each transaction, but fixed costs associated with facilitating each transaction are additive, and the risk of nonpayment increases.

A technique for reducing costs associated with payments include leveraging existing payment infrastructure, i.e., the DMV vehicle registration process. In addition, configuring RUC as a pre-payment system allows for upfront collection, reduced cost of administration related to enforcement and collections, and reduced transaction costs. Although post-payment has been more popular with consumers, pre-payment simplifies RUC administration and reduces the cost of running a program.

3.2.2. Detailed System Design

Numerous system design choices are reflected in technical documents that prescribe the nature of the program. These documents include, at minimum, a Concept of Operation (ConOps), Business Rules, System Requirements Specifications (SRS), and Interface Control Documents (ICD). The ConOps describes at a high level how the system functions. However, the business rules, SRS, and ICD together comprise technical details reflecting hundreds of individual choices about how the system should perform. Occasionally some of these choices may be of interest to policymakers. For example, one business rule that a RUC system in Hawaii would need to address is how to assess charges on a vehicle that is registered in one county but whose inspection took place in a different county. Should the miles reporting at that inspection be ascribed to the county where inspection occurred (and thus, presumably, where the miles were driven) or where the vehicle is registered (and to which, presumably, the county registration and weight taxes would be owed)? As another example, what should be done in

the case of a vehicles whose odometer mileage at inspection is less than the value reported in the previous year?

These two examples and many others require assessment, judgment, and decisions by the authorized agency's system designers. Each decision by itself does not necessarily impact overall system costs or customer experiences in a significant way. However, taken in the collective, these decisions shape the actual day-to-day operations and costs of a RUC system. They also collectively impact the type of experience that customers interacting with the system will have.

3.2.3. Contracts

To deliver a RUC program, implementing agencies typically rely on private-sector suppliers of technology or other goods and services. The degree of reliance depends on the policy and system design, but often at minimum includes software for mileage reporting. For example, the HiRUC Demonstration relied on PMVI for odometer mileage data, which in turn relies on HDOT's technology supplier for provision of the technology and software for keeping vehicle data collected from vehicle inspectors. Other mileage reporting methods relied on private-sector vendors for such applications as odometer image capture and plug-in device mileage reporting.

As New Zealand and Oregon have shown, if the enabling legislation allows or requires the implementing agency to rely on an open market approach to software and systems for RUC, such an approach can result in substantially lower costs of administration. But even in the case of Hawaii with a potentially manual-only (or manual-preferred) approach to mileage reporting, other elements of the system may benefit from procurement of private-sector suppliers. In these cases, implementing agencies can rely on existing processes and procedures, but as with any product sourced from the market, costs tend to be lower when the specific items being procured are from a market with substantial number of vendors and competition among them and/or in circumstances with highly limited services for specific functions.

3.2.4. Periodic Evaluation

If the enabling legislation for a RUC program calls for periodic evaluation, the details of who will conduct the evaluation and how specifically it will be conducted are typically left to the agency being evaluated. In these scenarios, to derive the greatest benefit at reasonable costs, maintaining a volunteer steering committee of agency stakeholders, consumer advocates, and elected officials, can help to guide the evaluation process of the RUC program to ensure the agency asks the right questions of importance to lawmakers. Typically an outside entity such as specialty consultancy or research organization can be highly effective at actually conducting the evaluation.

4. Conclusions

For policymakers crafting a RUC program in law, there are many choices to make. The key choices that impact cost revolve around rate setting, identifying subject vehicles, selecting an agency or agencies to administer the program, prescribing mileage reporting methods and other program features, defining the commercial model for any private sector participation in RUC administration, setting forth a transition timeframe for the vehicles in the state to become subject to RUC, and calling for regular reporting and evaluation of the program. Lawmakers could prescribe more details of a RUC program, but typically additional details are left to agency discretion, such as payment methods and channels, technical details of mileage reporting, and methodologies for system evaluation.

To support efficient administration, policy choices that, in general, start simple and allow for gradual transition to more complexity, among both policy and technical details, tend to be the most administratively efficient. For example, the most reasonable costs can be achieved by starting with simple flat per-mile rates, a relatively small group of vehicles whose compliance with a RUC requirement would be easier, and leveraging of existing infrastructure of the DIT and PMVI programs to the extent possible. Gradually extending the program to cover more vehicles with variable rate structures and additional high-tech methods of mileage reporting could be achieved at reasonable cost over time after the initial launch and successful operations of a low-cost starter system.

Periodic program evaluation during the early years of a small-scale start-up program can prove to be a key investment in reducing long-term costs. Particularly with proper oversight and participation by lawmakers, agency leadership, and stakeholders, an evaluation task force can help to ensure that early evaluations of the program focus on aspects that, among other things, identify cost drivers and opportunities to reduce them. New Zealand's example of continuous evaluation, even in a mature program, have yielded benefits for lowering cost of administration, improving compliance, and increasing revenue yield, which ties back to the fundamental purpose of a RUC program.