Western Road Usage Charge Consortium

Project 2A: Study of Inter-jurisdictional Road Usage Charge Issues

Final Report

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Executive Summary

The Western Road Usage Charge Consortium (WRUCC) carried out this study of inter-jurisdictional road usage charging on behalf of member state departments of transportation, including the Washington State Department of Transportation (WSDOT) as lead participant and the state DOTs of California, Colorado, Montana, Oregon, and Texas as joint funding partners.

The objective of this study was to develop and analyze approaches that jurisdictions can consider for charging motorists from other jurisdictions ("visitors") for road usage, alone and in cooperation with other jurisdictions. The results of the study include enumeration of a wide range of policy alternatives and corresponding operational concepts for charging for road usage by visitors, as well as approaches for multi-state collaboration in the reporting of visitor data, collection of charges, and reconciliation of revenue. In creating and analyzing alternatives, this study considered two perspectives:

- *Individual motorists*, including motorists adopting automated (e.g., in-vehicle devices) and manual (e.g., odometer readings or distance licenses) approaches to road usage charge reporting and payment.
- *Jurisdictions*, which can adopt bilateral or multilateral approaches for data reporting, charge collection, and revenue reconciliation.

This final report brings together into one document the key results and outcomes of the study as summarized below.

- First, the report presents unique issues raised by each participating state at the outset of the study, including a summary of cross-jurisdictional road facilities, existing policies and administrative programs that address cross-border travel by light vehicles, and major border population centers.
- Next, the report outlines five policies and three combinations of policies (a total of eight alternative policy approaches), for assessing charges on visitors for road usage. The list below briefly summarizes these eight alternative policy approaches.
  1. No charge. Visitors do not pay anything for road usage.
  2. Shadow charge. Visitors do not pay anything for road usage, but jurisdictions exchange funds to reflect differences in cross-border travel volumes and tax rates based on mutually agreed methodologies to measure or estimate cross-border travel.
  3. Charge based on fuel consumption. The host jurisdiction imposes a tax on fuel purchased by visitors, as is done today across North America. The tax may or may not also apply to residents.
  4. Charge based on time. The host jurisdiction imposes a charge on visitors based on the amount of time they access the host roadway network.
  5. Charge based on distance. The host jurisdiction imposes a charge on visitors based on the distance they travel on the host roadway network.

6. Distance-based, with shadow charges. The host jurisdiction imposes a distance-based charge on vehicles equipped with electronic distance- and location-reporting capabilities (including fuel tax offsets), but uses shadow charging for vehicles that opt for manual or non-location-based distance reporting in their home jurisdictions.
7. Distance-based and fuel-based, with or without shadow charges. The host jurisdiction imposes a distance-based charge on vehicles equipped with electronic distance- and location-reporting capabilities (including fuel tax offsets), but uses fuel taxes for all other visitors.
8. Distance-based and time-based. The host jurisdiction imposes a distance-based charge on vehicles equipped with electronic distance- and location-reporting capabilities (including fuel tax offsets) and time-based charging for all other visitors.

- The report goes on to describe simplified operational concepts for each of these eight alternatives. Operational concepts describe the measurement, reporting, and revenue collection mechanisms which could be employed to implement each policy, focusing on the motorist's perspective (i.e., what are the reporting and payment options for individual motorists under each policy alternative?).
- In addition, the report summarizes approaches for reporting and reconciling payments between (bilaterally) or among (multilaterally) jurisdictions. For multilateral reporting and reconciling, the report contrasts the "mesh" approach (a network of bilateral agreements among jurisdictions) and the "star" approach (a single, centralized hub which manages all reporting and reconciliation, with one connection to each jurisdiction).
- Lastly, the report highlights enforcement issues and challenges associated with each policy alternative for assessing charges on visitors.
- The report concludes with a summary matrix of policy alternatives, descriptions of individual reporting and payment options for each policy, and bilateral and multilateral jurisdiction reporting and reconciliation options.

The policy alternatives presented in this report are neither exhaustive nor prescriptive. They provide a range of approaches to addressing visitors in a multi-jurisdictional RUC environment and illuminate possible frameworks for implementing RUC in a cooperative multi-jurisdictional way. Not all of the alternatives are desirable or even feasible in many jurisdictions, few are appropriate for implementation at the present time, and no single alternative should be seen as a final solution. Rather, jurisdictions can consider each alternative at various points in time, with evolving policies and concepts as the jurisdictions move individually and collectively toward implementation of RUC.

Next steps in WRUCC's development of inter-jurisdictional RUC include addressing questions such as: are the revenue gains from multi-jurisdictional RUC worth the cost of implementation, how do RUC states address international travel (i.e., Canada and Mexico), and how might existing agency programs be adapted to support implementation of multi-jurisdictional RUC?

1 Introduction

The Western Road Usage Charge Consortium (WRUCC) carried out this study of inter-jurisdictional road usage charging on behalf of member state departments of transportation, including the Washington State Department of Transportation (WSDOT) as lead participant and the state DOTs of California, Colorado, Montana, Oregon, and Texas as joint funding partners.

How should visitors from out of state be treated under a RUC system? Requiring visitors to pay RUC will require special systems that potentially add to the cost of implementation and operation. This study has developed and analyzed a range of policies and operational approaches for one or more jurisdictions to assess, collect, and reconcile RUC collected from visitors.

Under the current fuel tax system, passenger vehicles using liquid, carbon based fuel for highway travel pay the federal motor fuel tax, regardless of where the driver lives, or where in the U.S the fuel is purchased. In addition, all states levy state fuel taxes, and some jurisdictions also levy regional and local fuel taxes. To date, this approach has been a generally acceptable method of collecting roadway taxes from drivers regardless of their state, city, or county of residence. Fuel has been seen as a surrogate for distance travelled or road usage.

Furthermore, the federal and state/local fuel tax collection system is indifferent to how many miles are actually driven within the taxing jurisdiction. For example, a driver of a family sedan that refuels in Moscow, Idaho (a town near the Idaho/Washington border) who then travels to Spokane, Washington and back will have driven 160 miles—156 miles on Washington state highways—but will have paid fuel taxes only to the state of Idaho and to the federal government, and none to Washington.[1]

Even though Washington receives no distribution of fuel taxes collected by Idaho, this tax system has been deemed generally acceptable on grounds that the system works both ways: drivers refueling in Washington may similarly drive many miles on Idaho roadways without direct remuneration to the Idaho highway fund. Except in a few extreme cases (such as border towns like Point Roberts, Washington where Canadians may travel with the exclusive objective of purchasing fuel at U.S. prices, then return to their homes in British Columbia), the general public does not perceive or complain of any inequities in this roadway funding system.

[1] This is not the case for interstate commercial vehicles over 26,000 pounds, which must report fuel consumed and distance traveled by jurisdiction to the International Fuel Tax Agreement (IFTA) administrators of their home jurisdictions on a quarterly basis, including payment or refund for fuel taxes owed. Jurisdictions then reconcile the fuel taxes owed by each vehicle to each jurisdiction through a clearinghouse run by IFTA, Inc.

By contrast, early indicators show that elected officials and the general public are troubled by the notion that under a RUC system, visitors may not be charged for use of a host state's roadways. Indeed, the opportunity for visitors into a RUC jurisdiction to buy tax-free fuel and pay no additional fees to use a roadway could potentially entice tax evasion in both jurisdictions. This "visitors drive free" scenario may or may not materialize, depending upon the policies, tax systems, and reciprocity agreements established within and between the various jurisdictions. However, unless provisions are made to address this issue, it could impair public acceptance of a RUC system.

The objective of this study was to develop and analyze approaches that jurisdictions can consider for charging motorists from other jurisdictions ("visitors") for road usage, alone and in cooperation with other jurisdictions. The results of the study include enumeration of a wide range of policy alternatives and corresponding operational concepts for charging for road usage by visitors, as well as approaches for multi-state collaboration in the reporting of visitor data, collection of charges, and reconciliation of revenue. In creating and analyzing alternatives, this study considered two perspectives:

- *Individual motorists*, including motorists adopting automated (e.g., in-vehicle devices) and manual (e.g., odometer readings or distance licenses) approaches to road usage charge reporting and payment.
- *Jurisdictions*, which can adopt bilateral or multilateral approaches for data reporting, charge collection, and revenue reconciliation.

For purposes of this report, we adopted the following terms and definitions:

- *Home jurisdiction*: the jurisdiction in which a vehicle is registered.
- *Visitor*: registered owner or lessee of vehicle(s) traveling outside the home jurisdiction.
- *Host jurisdiction*: jurisdiction in which a visitor travels.
- *Reconcile*: process of balancing two accounts, including calculation and payment of charges or refunds. We discuss two types of reconciliation:
    - *Individuals* reconcile the amount of charges paid with the amount of charges owed to all jurisdictions (home and hosts). Home jurisdictions or private account managers handle payments and refunds.
    - *Jurisdictions* reconcile the amount of charges collected from motorists with the amount owed by motorists. Additional payments or refunds are handled directly with other jurisdictions or through a clearinghouse.
- *Clearinghouse*: an entity that calculates reconciliation and, optionally, handles reconciliation payments among two or more jurisdictions.
- *Undifferentiated*: method of distance measurement that does not allocate distance by location but rather records all distance traveled.

- *Shadow charge*: a charge on one entity that is paid by another entity.

This final report brings together into one document the key results and outcomes of Tasks 2.1 and 2.2, and provides some conclusions. Chapter 2 presents the key issues for multi-jurisdictional RUC as identified by state DOTs participating in this study. Chapter 3 outlines the various policy alternatives and associated operational concepts for charging visitors in host jurisdictions in a multi-state RUC environment, and includes an overview of enforcement considerations for the eight policy alternatives. Finally, Chapter 4 comprises conclusions and proposed next steps.

In considering the policy alternatives and concepts presented in this report, it must be remembered that this is a tax policy. As such, exactness or specificity should be eschewed, particularly in early stages of a long-term evolution. In much of our tax policy, we set general rules or approximations. This was specifically cited in New Zealand by a special independent review board appointed by the Transport Minister to review the nearly 40-year-old Road User Charging System and make specific recommendations on changes or modifications. The review, much like this report, focuses on achieving a good balance between developing a highly accurate tax policy and keeping things simple and straightforward. In researching examples of other RUC programs, the New Zealand review board cited several initial trade-offs that would be required in any RUC system. One of these was simplification versus accuracy. For example, a better level of accuracy in cost allocation would create an overly complicated model. This would also imply a higher degree of accuracy than can be obtained in any allocation basis. Accordingly, a degree of averaging has to apply. To quote from the report:

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

The above point is not lost on this report. Any policy option can be made complex by trying to achieve too great a level of detail. Instead, we seek to balance simplicity and accuracy. The several policy approaches detailed in this report are intended to provide a range of approaches along that continuum with respect to the problem of out-of-jurisdiction travel under a RUC policy. The evolution of policy thinking from concept to functional to pre-operational and finally operational reality can be achieved through intelligent and thoughtful design in the program and through an incremental approach established by each jurisdiction. It will also help inform and educate key decision makers, key stakeholders, and the public about desirability of various policy alternatives that could underpin future system designs.

2 Unique Issues of Participating Jurisdictions

This section summarizes unique issues related to travel on state roads by visitors as related by representatives of participating states and reported in Task 2.1.

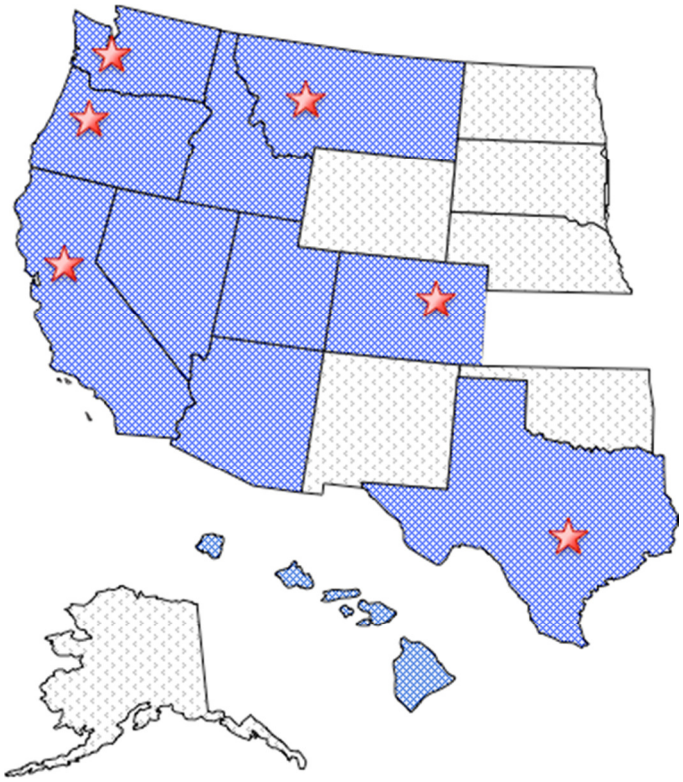
2.1 Participating jurisdictions

Shaded states in the map below indicate Western RUC Consortium members, and stars indicate jurisdictions participating in this study: Washington, Oregon, California, Texas, Colorado, and Montana. At the outset of this study, representatives of each jurisdiction provided answers to a range of questions regarding their unique policies and needs from this study. Questions included the following:

- Are there any policies, programs, or regulations in place that could form part of a future policy for charging visitors for road usage in your state?
- What is the typology of border crossings between your state and its neighbors?
- What are unique challenges facing your state relative to the issue of travel by visitors?

The subsequent sections summarize responses of each state.

Figure 2-1 Participating jurisdictions



2.2 Policies regarding visitors

The participating states provided a range of existing policies relating to visitors. The purpose of reviewing these policies was to see which policies, if any, could provide useful bases or extensions for future policies to charge for road usage by visitors. Since this study is looking exclusively at light vehicles, it does not consider any policies related to heavy trucks (defined as >10,000 pounds gross vehicle weight rating, or GVWR).

2.2.1 Resident vehicle registration requirements

All states require visitors to register their vehicles with the state once they establish residency and/or become employed in the state, but states have different time requirements for vehicle registration ranging from immediately (Montana) to within 30 days (Oregon). No state indicated any policies requiring visitors to register their vehicles except for Oregon, which does so after 6 months.

2.2.2 Nonresident vehicle registration requirements

In the U.S., all states require that residents register their motor vehicles within the state. Many states also require non-residents to register their vehicles in certain circumstances. WRUCC member states including California, Texas, Montana, and Arizona require that non-residents employed within the state register their vehicles with the state. Other states, such as Washington, Oregon, and Utah, require employment within the state and another "substantial step" that falls short of residency before any registration requirement kicks in. A substantial step may be living in the state for a specified duration (e.g., six months) while maintaining residency in another state, paying in-state tuition, or enrolling children in local schools. Other schemes base registration on the amount of time the vehicle is present in the jurisdiction. Although not a WRUCC state, Maryland, for example, requires registration if a vehicle is present within the state for a period of 60 days or more, notwithstanding residency or employment. This could be a useful policy example for future consideration.

Because of interstate travel and these additional registration requirements, there are often situations where dual registration is required. For example, individuals living in Arizona but working in California are required to register their vehicle in both states. In the event that dual registration is required, the corresponding registration taxes and fees must be paid in both states and two sets of license plates must be carried. Only one set must be displayed, and the plates do not need to be changed as the vehicle crosses between states.

States have enacted three different types of legislation aimed at non-residents to account for the disparity in infrastructure use between states where dual registration is required. The first type of legislation requires registration but at a reduced fee for "nonresident daily commuters." Both California and Arizona permit employees from a contiguous state to obtain from the state of employment a small decal (approximately 4" x 4") for a nominal fee (California: $15, Arizona: $33) in lieu of registration, if the vehicle is not brought more than 30-35 miles past the border,

and the contiguous state offers similar benefits to residents of the state of employment. Note that this program does not require an agreement between states. Residents of states such as Oregon and Nevada may still participate in this program even though their home state does not have an explicit program because there is no employment registration requirement in Oregon and Nevada, thereby automatically conferring reciprocal benefits on residents of, for example, California.

The second type of legislation makes nonresidents completely exempt from any registration requirements only if the state in which the nonresident resides has entered into an agreement with the state the nonresident enters into, which confers the same benefits upon residents of the state that the nonresident enters. No decal is required and there is no mileage limitation. Wyoming and Illinois both have legislation authorizing such agreements, but it does not appear that any agreements have been entered into.

The third type of legislation prorates registration for temporary employment cases of more than 30 days but less than one year. Montana appears to be the only state that uses this program. For short-term employment, most states will issue a temporary registration that allows a vehicle to operate within the state for a limited time (usually less than 30 days). Unlike the previous two types of legislation, which implicitly assume offsetting use and fees by residents in another state, these types of programs recognize that paying a year's worth of registration fees may overcharge a temporary nonresident for the use of the infrastructure. These programs are akin to a time permit, where upon payment of a fee by the vehicle owner, a state issues a permit for a specified duration allowing non-registered vehicles legal access to public roadways.

Administration and enforcement of these programs and agreements raise many challenges. First, many nonresidents may be unaware that they must register their vehicles in a second state. Second, the programs that afford nonresidents an opportunity to avoid paying full registration costs are poorly publicized. While some people are aware of the registration requirement, many are unaware of these programs that create exceptions. Lastly, it is almost impossible to differentiate between those who must register, those not required to register, and those who are simply avoiding their obligation. Aside from a comprehensive investigation by law enforcement, enforcement is limited. California has led the charge in targeting registration violators by creating a "Cheaters" program, which solicits voluntary tips from citizens when they become aware of residents and nonresidents alike violating one of the registration laws.

These examples of existing policies, program administration, and enforcement are a few examples that could someday form both a policy and organizational basis for a multi-jurisdictional RUC program.

2.3 Roads crossing jurisdictional boundaries

The table below provides a high-level summary of the number and types of roads crossing jurisdiction boundaries from each state.

Table 2-1 Jurisdictional boundary roadways

State	Interstate	Other Highways	Other Roads and Local Streets	Total
California	6 (1 int'l)	26 (5 int'l)	156	188
Colorado	6	35	283 (19 paved)	324 (60 paved)
Montana	5 (1 int'l)	12 (3 int'l)	135 (9 int'l)	152
Oregon	5*	19	67	93
Texas	7	105 (28 int'l)	155	267
Washington	5 (1 int'l)*	19 (6 int'l)	14	38

Notes:

1. *int'l = international*
2. **Each of the 3 Interstate highway crossings between Oregon and Washington consists of two one-way bridges, but each is counted as one crossing.*

2.4 Other special considerations

States reported several common issues, as summarized below:

- States collect fuel taxes at the distributor and/or terminal rack level, "upstream" from the pump and retail customers. This method, whereby fuel importers, wholesalers, and refiners pay the tax, allows states to collect taxes from a smaller number of taxpayers. The only exception to this is Oregon, where fuel sellers also collect diesel tax at the retail level.
- All participating states have substantial cross-border travel, including mid- to large-size metropolitan areas which tend to have unbalanced commuter flows from one direction to the other (e.g., the majority of commuters in Portland, OR-Vancouver-WA that cross the border live in Washington and work in Oregon):
    - Oregon-Washington
        - Portland, OR-Vancouver, WA
        - Milton-Freewater, OR-Walla Walla, WA
        - Rainier, OR-Longview, WA
    - Oregon-Idaho
        - Ontario, OR-Boise, ID
    - California
        - San Diego, CA-Tijuana, Mexico
        - Lake Tahoe, CA-NV

- Montana
  - Eastern Montana-Western North Dakota (energy traffic, including commuters)
- Texas
  - Texarkana, TX-AR
  - El Paso, TX-Las Cruces, NM-Juárez, Chihuahua
  - Del Rio, TX-Acuña, Coahuila
  - Eagle Pass, TX-Piedras Negras, Coahuila
  - Laredo, TX-Nuevo Laredo, Tamaulipas
  - Lower Rio Grande Valley, TX-Tamaulipas

In addition, there were several issues unique to one or several participating states:

- Montana has a large number of fuel tax refunds particularly due to agricultural sector, amounting to $2.9 million, or approximately 1.5% of total state fuel tax collections of $200 million per year.
- Oregon, Washington, and Montana provide web-based, self-issued trip permits for heavy vehicles. Although this memorandum is not addressing heavy vehicles, awareness of such permit systems could be useful should a state adopt a similar approach for light vehicles.
- California has agriculture inspection points near major border crossings. The purpose of these inspections is to ensure compliance with quarantine and agriculture policies.
- At least one metropolitan planning organization (MPO) in Texas (Texarkana) provides for some regional revenue sharing based on the traffic flows across state borders in the region.
- With the exception of Utah, none of Colorado's neighbors is participating in WRUCC.

3 Policy Alternatives and Operational Concepts for Charging Visitors

Given the connectivity among states as evidenced by border metropolitan areas and crossing points, and given the lack of existing mechanisms for administering inter-jurisdictional revenue collection for light vehicles, RUC may require new multi-jurisdictional policies and operations. This chapter outlines potential policy and operational alternatives for charging visitors in a multi-jurisdiction RUC environment. Section 3.1 provides a summary of the five policy bases and three combinations of policies as portrayed in previous memoranda. Section 3.2 describes (for each policy basis) the corresponding operational concept alternatives including relevant reporting and payment options for individual motorists. Sections 3.3 and 3.4 cover bilateral and multilateral jurisdiction reporting and reconciliation alternatives, respectively, for each policy alternative. Lastly, section 3.5 outlines enforcement considerations for each policy alternative.

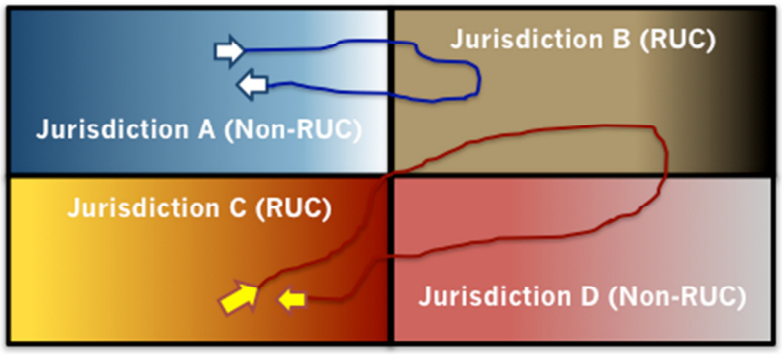
3.1 Summary of policy alternatives for multi-jurisdictional road usage charging

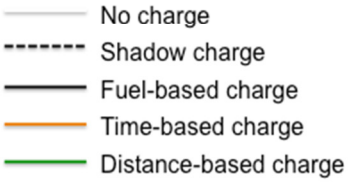
The table below summarizes five policy bases and three combinations of policies that a jurisdiction could use to charge visitors.

Table 3-1 Summary of policy bases for multi-jurisdictional RUC

Policy Basis	Description of Policy Basis
1. No charge	The host jurisdiction does not charge visitors for road usage.
2. Shadow charge	The host jurisdiction does not charge visitors for road usage, but measures or estimates their usage as the basis for a reconciliation of funds collected by the visitor's home jurisdiction. For example, this could apply for visitors with a manual (e.g., odometer-based) RUC reporting option in their home jurisdiction. It could also work in conjunction with a fuel-based charge.
3. Charge based on fuel consumption	The host jurisdiction imposes a tax on fuel purchased by visitors. The tax may or may not also apply to residents.
4. Charge based on time	The host jurisdiction imposes a charge on visitors based on the amount of time they access the host roadway network.
5. Charge based on distance	The host jurisdiction imposes a charge on visitors based on the distance they travel on the host roadway network.
6. Distance-based, with shadow charges	The host jurisdiction imposes a distance-based charge on vehicles equipped with electronic distance- and location-reporting capabilities (including fuel tax offsets), but uses shadow charging for vehicles that opted for manual or non-location-based distance reporting in their home jurisdictions.
7. Distance-based and fuel-based, with or without shadow charges	The host jurisdiction imposes a distance-based charge on vehicles equipped with electronic distance- and location-reporting capabilities (including fuel tax offsets), but uses fuel taxes for all other visitors.
8. Distance-based and time-based	The host jurisdiction imposes a distance-based charge on vehicles equipped with electronic distance- and location-reporting capabilities (including fuel tax offsets) and time-based charging for all other visitors.

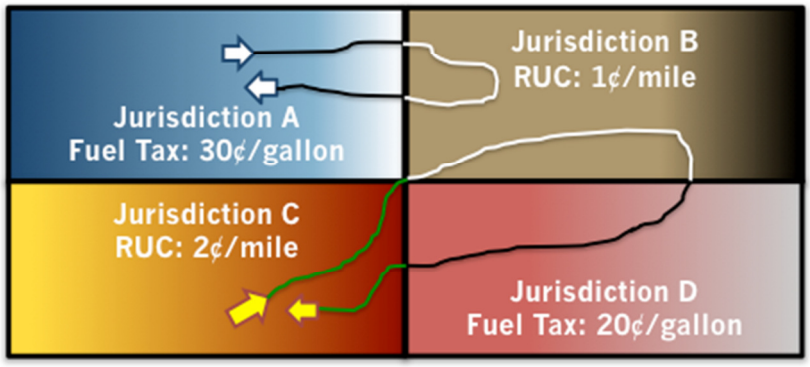
Each section that follows describes each policy alternative in more detail. In addition, each section includes an illustration of the policy basis using four notional jurisdictions illustrated below. In the image at left, jurisdictions B and C impose RUC on their residents, while A and D have only a fuel tax. We illustrate two journeys. The top journey involves a visitor from a non-RUC jurisdiction to a RUC jurisdiction. The lower journey involves a visitor from one RUC jurisdiction to both another RUC jurisdiction and a non-RUC jurisdiction. The path of each journey is color coded by the policy basis of the charge being paid by each visitor. The legend at right summarizes the type of policy indicated by each path.





3.1.1 Policy alternative 1: No charge

Under this alternative, *a jurisdiction with RUC for its own residents and without fuel tax collected at the terminal rack could simply not charge visitors*. This policy alternative is mutually exclusive with all other alternatives.



Under RUC, a state could choose to ignore any miles traveled by visitors. The advantages of this policy are that (1) there is no administrative or enforcement cost to the state, and (2) there is no burden or cost placed on visitors to comply.

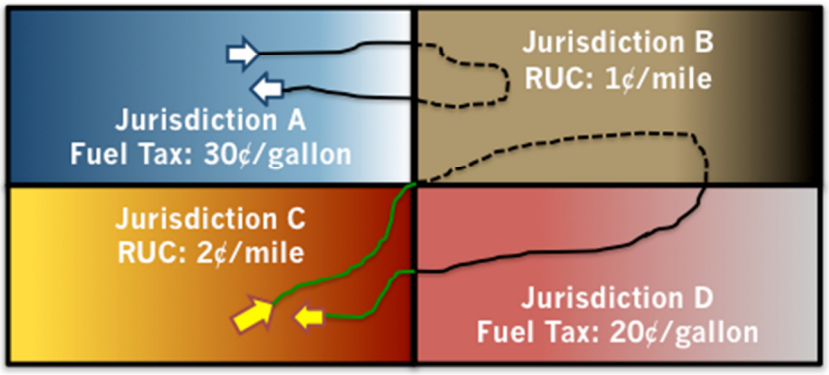
However, this approach has several disadvantages. First, visitors do not contribute revenues despite imposing costs. Secondly, the imbalance in tax treatment between visitors and residents could be a constitutional (Commerce Clause) issue. Thirdly, such a policy could exacerbate fuel tax arbitrage, a strategy by which motorists aim to purchase most of their fuel in low-cost (in this case, no-tax) jurisdictions, despite driving

elsewhere. For example, motorists fueling up in jurisdiction B but driving in D are not paying any tax to any jurisdiction. Finally, it causes taxes to fall on the wrong people. For example, those fueling up in jurisdiction A while traveling in B are paying tax to the "wrong" jurisdiction (i.e., tax paid to A on fuel used to drive in B). Similarly, a visitor from jurisdiction C who pays undifferentiated RUC would be "double taxed" if purchasing any fuel in jurisdiction D and driving in C (fuels tax paid to D and RUC paid to D for the same miles).

If administering a multi-state reporting and monitoring administration proves too costly and/or if the balance of traffic between any two jurisdictions is relatively even, there may be a compelling case not to charge visitors. However, when these conditions are not met, it is important to consider other alternatives such as the alternatives presented below.

3.1.2 Policy alternative 2: Shadow charge

A *shadow charge* refers to the notion that, *while the visitor makes no payment and incurs no administrative burden, the jurisdiction will nonetheless attempt to measure or approximate travel by visitors and perform a reconciliation with neighboring states* on the basis of measured or approximated travel data. In the example illustrated at left, jurisdictions A and B would attempt to reconcile based on the measured or estimated travel of the traveler between those two jurisdictions. Suppose the trip by the resident from jurisdiction A in jurisdiction B was 100 miles. At $0.01 per mile, jurisdiction A owes jurisdiction B $1.00. The amount of miles would either be estimated or measured approximately by monitoring the roadways—in either case using a methodology mutually agreed by the states. The motorist herself would not have to report any miles or make any payment. This policy option can be coupled with other policies, in particular for visitors who opt for distance-based charges in their home state but do not differentiate miles driven by jurisdiction.



The motivation for using this approach is that it addresses some of the flaws of the "no charge" policy—namely, when there is an imbalance of flows between jurisdictions (i.e., the case where tax is paid to the "wrong" jurisdiction). For example, if Oregon and Washington can use reliable, mutually-agreeable data and metrics to calculate miles traveled by visitors from one state to the other, while also accounting for any differential in RUC rate between the two states, they

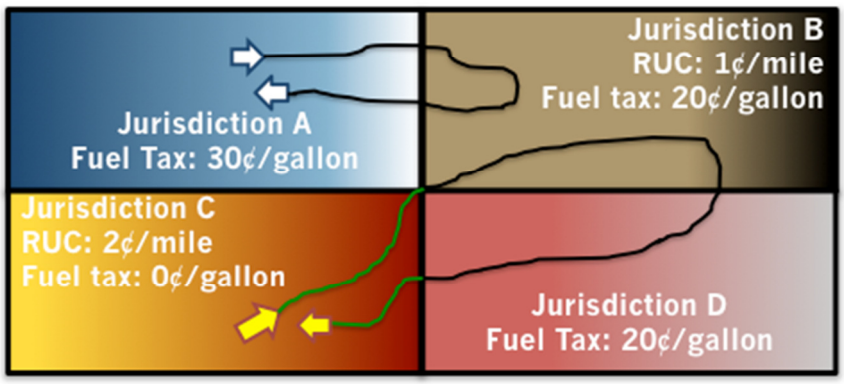
could theoretically calculate the approximate amount of the imbalance and settle it between jurisdictions without requiring any recourse to individual motorists.

From the perspective of a visitor, this policy is the same as not charging at all. However, from the perspective of the jurisdiction, it implies additional administrative responsibilities, accounting, and reconciliation of funds owed on a recurrent basis. This policy is a distinct policy from all the others presented in this section: unlike the "no charge" alternative, it attempts to address visitors; while unlike the remaining alternatives, it addresses visitors without directly requiring any payment by individual motorists.

Still, it has several disadvantages. First, visitors to not contribute revenues despite imposing costs. Again, this could create a constitutional issue due to the disparate tax treatment between residents and visitors. In addition, the source of funds for the reconciliation of shadow charges must come from another source. In the example above, jurisdiction A must pay jurisdiction B out of fuel tax, general funds, or using some other mechanism. The result is that residents of A subsidize visitors going to B. Finally, there may be an imbalance between states with RUC to the extent they have varying per-mile rates, and any jurisdictions that agree to using shadow charges will need to consider this difference in their reconciliation agreements.

3.1.3 Policy alternative 3: Charge based on fuel consumption

Should a jurisdiction with RUC for its own residents desire to charge visitors directly, one readymade option is the fuel tax. All states in the U.S. collect fuel taxes, most at the terminal rack, including the states participating in this study. Should fuel taxes continue to be collected in this manner, with the price passed to the consumer, this is one way to capture revenue from visitors.



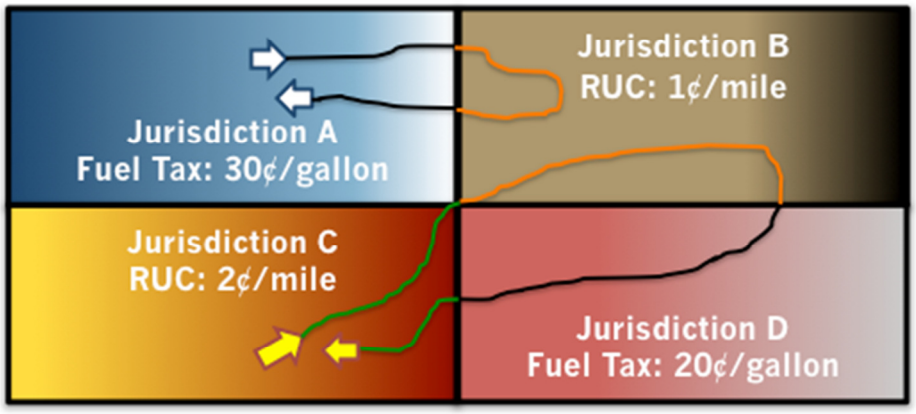
There are numerous advantages of a fuel tax approach to charging visitors. First, the policy and administration are familiar and straightforward. All states have existing bureaucracies dedicated to fuel tax collection, compliance, and accounting. Consequently, the marginal cost of this approach is zero. Secondly, it requires no action on the part of

visitors, yet they still contribute something for their use of the roads, even if the contribution does not precisely match the level of usage, except for visitors whose vehicles do not consume taxable fuel (e.g., electric vehicles).

There are several disadvantages to this approach. The possibility exists for some visitors to pay little or no fuel tax—for example, by purchasing fuel in another state before traveling. However, this phenomenon occurs today without any apparent concern or remediation by the states, likely due to an assumption of balanced revenues lost and gained. Secondly, for those visitors who do purchase fuel, the fuel tax does not capture revenue equitably from highly fuel-efficient vehicles. For example, a plug-in hybrid using little or no fuel pays little or no fuel tax in states visited. This phenomenon is the driving force behind much of the activity to look at RUC in states, so it may likewise be important from a policy perspective to address highly fuel-efficient vehicles belonging to visitors, which the fuel tax does not. Thirdly, small, pass-through jurisdictions may not be able to capture fuel tax revenue from visitors, although this is less a concern in WRUCC states.

3.1.4 Policy option 4: Charge based on time

In lieu of a fuel tax, jurisdictions might consider a time-based charge, also known in Europe as a *vignette*. *A time-based charge would require any visitor to pay for time spent on roads in the host jurisdiction in exchange for unlimited travel* in the host jurisdiction during that time period. There are numerous ways to implement this policy and for varying lengths of time (e.g., 1 day, 1 week), but the fundamental concept is to charge visitors for entry on a time basis rather than based on distance traveled or fuel consumed. This has become a preferred policy option for several European countries as a means to charge visitors a fee for road usage.

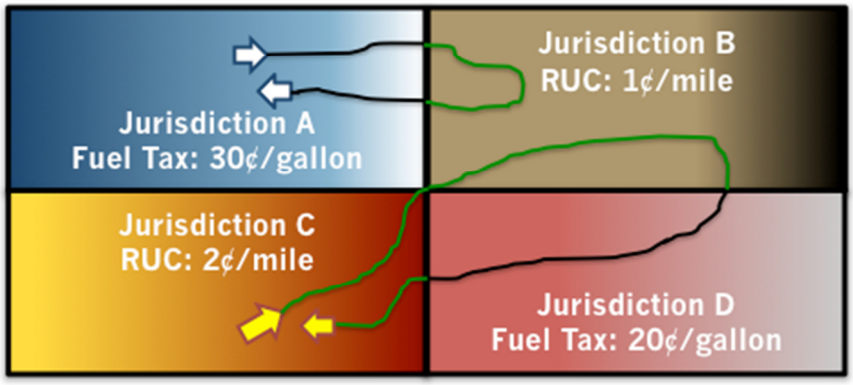


Time-based charges are relatively cost-effective to administer and do not necessarily require any technology for the visitor. Moreover, a precedent for such charges may exist in states such as California, Nevada, Arizona, and Oregon, in that these states require non-resident employees to purchase a visitor registration permit in order to commute, which would be quite similar to a charge based on time for visitors.

There are several disadvantages to this option. First, the host jurisdiction must create and operate some form of time permitting system either alone or in combination with other jurisdictions. Secondly, evasion opportunities would be numerous, so enforcement would need to be carefully planned and implemented for maximum effectiveness. Thirdly, time-based charges generally do not reflect actual costs imposed by visitors. Finally, fuel tax arbitrage remains an opportunity, which is a potential detriment to those states that rely only on fuel taxes for visitor revenue.

3.1.5 Policy option 5: Charge based on distance

Under this option, *the host state would require all visitors to report distance travelled as the basis for paying a tax*. There is precedent for this option. Heavy vehicles effectively pay for road usage based on distance through IFTA, which converts fuel taxes into mileage-based taxes owed to all states visited. Conceptually, it is not a divergent policy to require visitors to pay a distance tax, particularly if locals are also required to pay it. The methods of implementation may vary, but the fundamental policy is to charge based on distance, rather than time spent or fuel consumed.

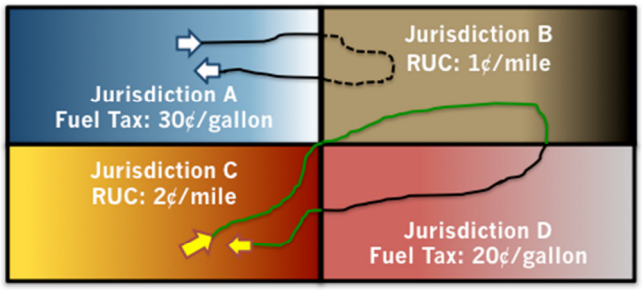


For a state with RUC, this resolves the constitutional issue of different treatment of visitors vs. residents. Also, it removes any revenue distortions such as those associated with fuel taxes and time-based charges.

However, distance-based charges for visitors may lead to administrative and enforcement challenges. Collecting distance-based charges from visitors equipped with location-based distance reporting is straightforward, but no jurisdiction is contemplating a GPS mandate for RUC, so any distance-based charge on visitors must consider alternatives for unequipped vehicles. It is highly unlikely that any jurisdiction will ever require such visitors to report every trip made into a host jurisdiction. Enforcement and evasion become a major issue for visitors without location-based RUC measurement devices.

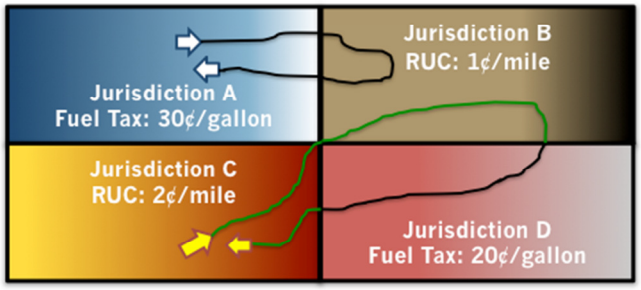
3.1.6 Policy option 6: Distance-based with shadow charges

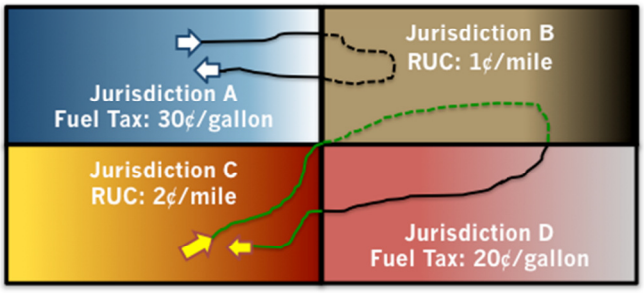
Under this combination, visitors equipped with the ability to differentiate distance by location would report and pay for road usage based on distance traveled. This combination assumes no fuel tax in place. Those without differentiated distance (i.e., GPS devices to measure RUC) would continue paying either undifferentiated RUC or fuel taxes to their home jurisdiction. These undifferentiated RUC payments could be reconciled using shadow charges, based on approximated aggregate mileage traveled in each jurisdiction, using an estimation methodology or model agreed mutually by participating states. This option has the advantage that it does not impose any additional RUC reporting requirements for any visitors beyond those of their home state. However, it could allow some residents to engage in arbitrage, for example by choosing an undifferentiated reporting method for their home state, knowing that neighboring states have higher RUC rates. In effect, such individuals would be underpaying to neighboring states.



3.1.7 Distance-based and fuel-based, with or without shadow charges.

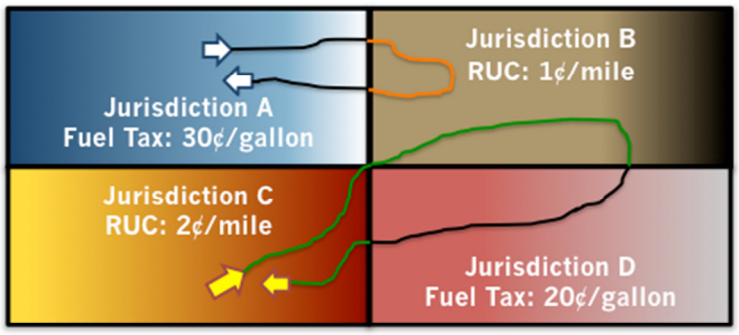
Under this combination, visitors equipped with the ability to differentiate distance by location (i.e., those with location-based RUC measurement devices) would report and pay for usage based on distance traveled, while receiving fuel tax refunds. All other visitors would continue paying fuel taxes. In this scenario, states could optionally include shadow charges to allocate fuel receipts to miles traveled, using an agreed methodology or model for reconciliation. The disadvantage of this approach is that it would not work in a state that no longer collects fuel tax. Images below depict distance-based charges for the visitor from jurisdiction C and fuel-based charges for the visitor from A. Shadow charges for these trips are illustrated on the right side.





3.1.8 Distance-based and time-based

This combination once again requires visitors with differentiated distance reporting (location-based RUC measurement devices) to report and pay for actual miles traveled. Those without differentiated distance would be required to pay a time-based charge. The advantage of this approach is that it does not allow visitors to game the system, assuming time-based charges are set to exceed equivalent distance-based charges (e.g., the cost of a one-day time permit equals the cost of 500 miles). Under this approach, no shadow charges are required as there are no funds to reconcile. The disadvantage of this approach is that it would require two separate RUC payment systems to be administered by the host state.



3.2 Operational concepts

This table below provides a summary of the operational concepts corresponding with each policy basis.

Table 3-2 Summary of operational concepts for multi-jurisdictional RUC

Policy Basis	Operational Concepts
1. No charge	There is no corresponding operational concept for this policy, as it requires no action by either the visiting motorist or the host jurisdiction.
2. Shadow charge	There is no reporting or payment required for travel in host jurisdiction by a visitor. However, the host and home jurisdictions must agree to a measurement or estimation methodology of cross-border travel and an approach for reconciliation.
3. Charge based on fuel consumption	Collect fuel tax at terminal rack. Refund or offset fuel taxes against distance-based or time-based charges for all residents (and potentially visitors).
4. Charge based on time	Manual or electronic time permits for visitors issued for varying time increments such as one day, one week, or one month.[2]

[2] Several states have existing programs that effectively issue time permits to frequent visitors or commuters who live in one state but work in an adjacent state. These programs could be used as the foundation for a time-based charge.

Policy Basis	Operational Concepts
5. Charge based on distance	There are two categories of operational concept for distance-based charges on visitors: manual and electronic, summarized as follows. • Manual operational concept: The host jurisdiction could require visitors to report and pay for all miles for each trip based on manual, self-reported trip reports. Although this approach may be the least desirable for a variety of reasons, it is nonetheless feasible. • Electronic operational concept: The host jurisdiction allows visitors to use approved location-based methods to report miles traveled in each jurisdiction and pay their host jurisdiction the RUC corresponding to amounts owed in all states traveled. Visitor could pay the host jurisdiction directly or pay their home jurisdiction. If the latter, then a multi-state reconciliation process must be in place, which is the subject of sections 2.2 and 2.3. Note that this policy alternative is very likely unavailable for visitors who have opted for a non-technology or non-location-based reporting method in their home jurisdiction (e.g., without GPS, they cannot use an electronic method to report distance traveled in the host state), nor is it available for visitors from jurisdictions without distance-based charges, unless the host jurisdiction requires visitors to equip their vehicles with location- and distance-based reporting equipment.
6. Distance-based, with shadow charges	Combination of electronic distance-based charging with shadow charging.
7. Distance-based and fuel-based, with or without shadow charges	This concept combines electronic distance-based charging with fuel-based charging. Optionally, the host jurisdiction could also use shadow charging for visitors with non-location-based reporting from their home jurisdictions.
8. Distance-based and time-based	This concept combines electronic distance-based charging with time-based charging.

The table below summarizes options available to individual motorists (visitors) for reporting and paying RUC. The options vary depending upon the policy basis in place and the corresponding operational concept.

Table 3-3 Summary of individual reporting and payment options for each policy basis

Policy Basis	Individual Visitors' Reporting and Payment Options
1. No charge	• Reporting: Nothing to report. • Payment: Nothing to pay.
2. Shadow charge	• Reporting: Nothing to report to host jurisdictions. However, motorists may be obligated to report travel to their home jurisdiction undifferentiated by location. • Payment: Nothing to pay outside of tax obligations to home jurisdiction.
3. Charge based on fuel consumption	• Reporting: Nothing to report. • Payment: Payment of charges is done indirectly in the form of fuel taxes, which are included in the price of fuel.

Policy Basis	Individual Visitors' Reporting and Payment Options
4. Charge based on time	• Reporting: Visitors must report their presence in the host jurisdiction and the length of time they intend to stay prior to or upon entry. This could be done in person, via telephone, or via Internet. • Payment: Visitors must purchase a time permit corresponding with an amount of time covering at least the amount of time they plan to stay in the host jurisdiction. The time permit may allow for "in and out" privileges.
5. Charge based on distance	If electronic with location-based reporting, motorists' in-vehicle devices report distance traveled in each jurisdiction to their home jurisdiction or private account manager. • Reporting: Visitors report distance traveled by jurisdiction to their home jurisdiction or to their private account manager automatically, for all jurisdictions with which the home jurisdiction or account manager has an agreement. • Payment: Visitors pay the home jurisdiction or private account manager for all miles traveled by jurisdiction, for those jurisdictions with which the home jurisdiction has an agreement, at the rate prescribed by each jurisdiction. Visitors who report distance manually to their home jurisdiction must report distance of each trip in a host jurisdiction. This also applies to visitors with electronic reporting capabilities but whose home jurisdictions or private account managers do not have an agreement with the host jurisdiction, or for visitors to a host jurisdiction who otherwise do not accept electronic distance reporting. • Reporting: Visitors must report the distance they traveled in the host jurisdiction directly to the host jurisdiction, or in the case where the host and home jurisdictions have an agreement for manual trip reporting, to the home jurisdiction. • Payment: Visitors must pay the host state the number of miles traveled times the rate per mile, either directly to the host jurisdiction or, in cases where the host and home jurisdictions have an agreement, to the home jurisdiction. In either case, the appropriate per-mile rate for each jurisdiction must be applied to the mileage. Private account manager option: Some states may allow motorists to use a private account manager. A private account manager is a private company that acts as an agent for recording distance and, if opted by the motorist, location data, including billing and collection of RUC. If private account managers are allowed to provide the measurement and collection of RUC across state lines, they could apply the per-mile rate to mileage driven in each jurisdiction, collect RUC from the motorist, and remit revenues to all participating jurisdictions or to a clearinghouse operated on behalf of all participating jurisdictions.

3.3 Bilateral jurisdiction reporting and reconciliation options

This section provides an outline of alternatives for reporting and reconciling RUC between two jurisdictions (bilateral jurisdictions) under the five policy bases and three combinations of policies described in section 3.1 above.

3.3.1 No Charge

This is the status quo policy alternative whereby jurisdictions undertake no bilateral reporting of miles travelled for individual motorists. Thus, there would be no reporting, collection or reconciliation. Under Oregon's Road Usage Charge program, to be implemented in July 2015 pursuant to 2013 Senate Bill 810-Enrolled, there is no charge for out of state vehicles. RUC applies only to Oregon-registered vehicles.

3.3.2 Shadow Charge

This policy alternative would not comprise collection of payment since visitors make no payment and incur no administrative burden. Thus, the options described below are related solely to reporting and reconciliation.

Shadow Charge Reporting Options

To report and exchange information on estimated cross-jurisdictional travel between two jurisdictions with or without a common border, both jurisdictions must agree on the methodology for estimating distance travelled by visitors on each jurisdiction's roadways. This includes the ability to estimate mileage by visitors in each individual jurisdiction.

There are two main options for jurisdictions to collect and report data about distances traveled on its roadways by visitors:

- Agree and use the same methodology for estimating distances traveled in each jurisdiction by visitors from all other jurisdictions, or
- Each jurisdiction reviews and agrees to the other jurisdiction's distinct methodology. This may seem a bit cumbersome but some jurisdictions have an established methodology for calculating miles traveled in legislation (for both in-state vehicles and visitors), which might prevent — from a legal perspective — the adoption of the "same" methodology for both jurisdictions.

The key to either option for collecting and reporting data is that both jurisdictions agree to report distance traveled based on standard and agreed metrics, whether or not the methodology is the same.

In addition to travel, the reporting period (e.g., monthly, quarterly, annually) will also need to be agreed bilaterally, and may vary from one bilateral jurisdiction to another.

Based on the methodology selected or the distinct methodologies bilaterally accepted, each jurisdiction collects data about distances traveled by resident motorists and visitors from the other jurisdictions. There are several potential sources of data for distance traveled, including the examples below:

- Floating car data (FCD) are anonymous data collected from a sample of equipped vehicles in a fleet for purposes of travel pattern analysis. FCD are available from some state transportation agencies and from private data providers. In the future, vehicles opting for electronic RUC reporting can serve as FCD data points. These data can be used to

extrapolate estimates of distances travelled by visitors in each jurisdiction. This source of data is likely a longer-term solution or methodology since at the outset of implementing RUC, it is very likely that the number of equipped vehicles will be too small to provide a sufficient sample size for statistically valid extrapolation.

- FCD based on data purchased from vendors who track private vehicles and fleets for purposes of travel analysis. In some cases, these data sets may be useful for estimating visitor travel by jurisdiction.
- Roadside equipment comprising traffic counters and automated license plate reader (ALPR) cameras, especially those posted on roadways at jurisdictional boundaries. As noted in the Task 2.1 memo, the jurisdictions participating in this study have dozens to hundreds of cross-jurisdictional roadways. However, it is likely that the vast majority of cross-jurisdictional traffic is concentrated on key crossings such as Interstates and other major highways. This could lead to significant savings in the cost of roadside equipment because:
    - Adjacent jurisdictions could deploy equipment at selected crossings that will provide data for all participating jurisdictions, and
    - The number of boundary roadways necessitating roadside equipment could be focused on key crossings with the vast majority of traffic such as Interstate highways.
- Travel surveys administered at the roadside for purposes of trip sampling to estimate total mileage by visitors.

Although roadside equipment can detect visitors, they cannot provide accurate, reliable estimates of distance traveled by the visitors. Therefore, such technology would be useful primarily as one source of input data for estimating aggregate cross-border travel by vehicles subject to RUC and specifically subject to shadow charges.

Shadow Charge Reconciliation Options

Since motorists would not be required to measure or report travel, nor pay any charges under a shadow charge, the options for reconciliation between bilateral jurisdictions would be limited to the jurisdictional level. The computations would be the balance of travel between two jurisdictions based on the agreed methodology, any difference in the distance-based RUC rates, and conversion factors if necessary (e.g., km, foreign exchange rate).

3.3.3 Charge Based on Fuel Consumption

For this policy alternative, host jurisdictions would collect fuel tax, as is the current situation. Consequently, there would be no reporting and reconciliation required between bilateral jurisdictions unless desired to do so following the model of the International Fuel Tax Agreement (IFTA), which applies only to heavy interstate vehicles (>26,000 pounds gross vehicle weight rating, or GVWR). It should be noted that this option might not be viable due to complexities associated with agreeing among multiple jurisdictions where fuel was purchased. This option would also require the capture of reliable fuel purchase data from all motorists, which would be cost prohibitive.

3.3.4 Charge Based on Time

Host jurisdictions would issue time permits (e.g., day, week, month, year) and collect payment directly from visitors. The reporting options described below concern strategies for bilateral jurisdictions (two adjacent jurisdictions) with a common border to implement and operate systems for unilateral or bilateral jurisdiction time permits.

Time-Based Reporting Options

For reporting and information exchange on time permits issued and revenue generated, both jurisdictions might want to exchange this information. Means of reporting and information exchange on time permits as well as other issues like signage can be summarized as follows:

- Time permits could be issued in either electronic or paper formats. Electronic format (e.g., enforced by digital read of license plates) may be preferable for the following reasons:
    - Time permits in paper format would require anti-counterfeit for the design and printing to deter potential copying, which would be a significant cost difference compared to electronic permits with each registered visitor having their license plate entered into a dedicated database at the state or regional level.
    - Secure transfer and storage of time permits in paper format — like handling cash — would be required to deter potential theft.
    - Electronic permits could be automatically verified by roadside equipment or mobile units, whereas paper permits would always require human intervention for first level verification. There is a significant cost advantage for electronic vs. paper permits.
    - Either choice for the time permit would require implementation of associated enforcement policies and procedures.
- Time permit website(s). The design, implementation and operation of RUC-related websites for time permits comprise three distinct scenarios which could also be transitional in nature with the long-term goal being a US- or region-wide dedicated website for time permits in all participating jurisdictions. The three scenarios are described as follows:
    - Each jurisdiction implements and operates its own dedicated RUC time permit website for visitors.
    - Two jurisdictions (bilateral jurisdictions) implement one website for motorists in each jurisdiction driving as visitors in the other jurisdiction. This would reduce costs for each jurisdiction and allow them to share in the cost of design (branding) and operations of a RUC time permit website.
    - All jurisdictions requiring RUC time permits for visitors could be “members” of a US- or region-wide dedicated RUC time permit website. This would allow all participating jurisdictions to share the design (branding), implementation and operations costs thereby reducing costs concomitantly for websites set up by individual or bilateral

jurisdictions. Although each state could adapt its own registration website to accommodate RUC time permits, a single website covering all states would be less costly and simpler to use from a user perspective, particularly for travelers crossing multiple states.

- Time permit kiosks located at a limited number of border crossings could be designed, built and operated on behalf of both jurisdictions for visitors. Alternatively, jurisdictions could implement and operate time permit kiosks on each side of key border crossings. This approach would likely double the implementation and operations costs. If RUC time permit kiosks are co-located for a pair of jurisdictions, a key issue would be which side of the border to locate the kiosks. For example, if there are ten key/strategic border crossings between two adjacent jurisdictions, the location could be such that five kiosks are located near the border in each of the two jurisdictions, respectively. Placement should also be chosen to reflect demand from visitors entering the jurisdiction.
- Jurisdictions could decide to have their own dedicated time permit kiosks on both sides of the border at all key/strategic locations. This would increase implementation and operations costs for both jurisdictions. However, it would enable both jurisdictions to avoid having to deal with reconciliation of revenue at co-located kiosks.
- Roadway signage. Since motorists from one state crossing a border to another state will be required to obtain a time permit prior to driving on roadways as visitors, it is incumbent on jurisdictions to design and implement corresponding roadway signage at or very near border crossings. This RUC time permit signage could be designed as a WRUCC research project in order to harmonize RUC-related roadway signage in the case of time permits.
- Roadside equipment (cameras). In the case of electronic time permits, roadside equipment could be located near the borders (but not upstream of the kiosks) to verify via ALPR that visitors have obtained the time permit prior to entry.

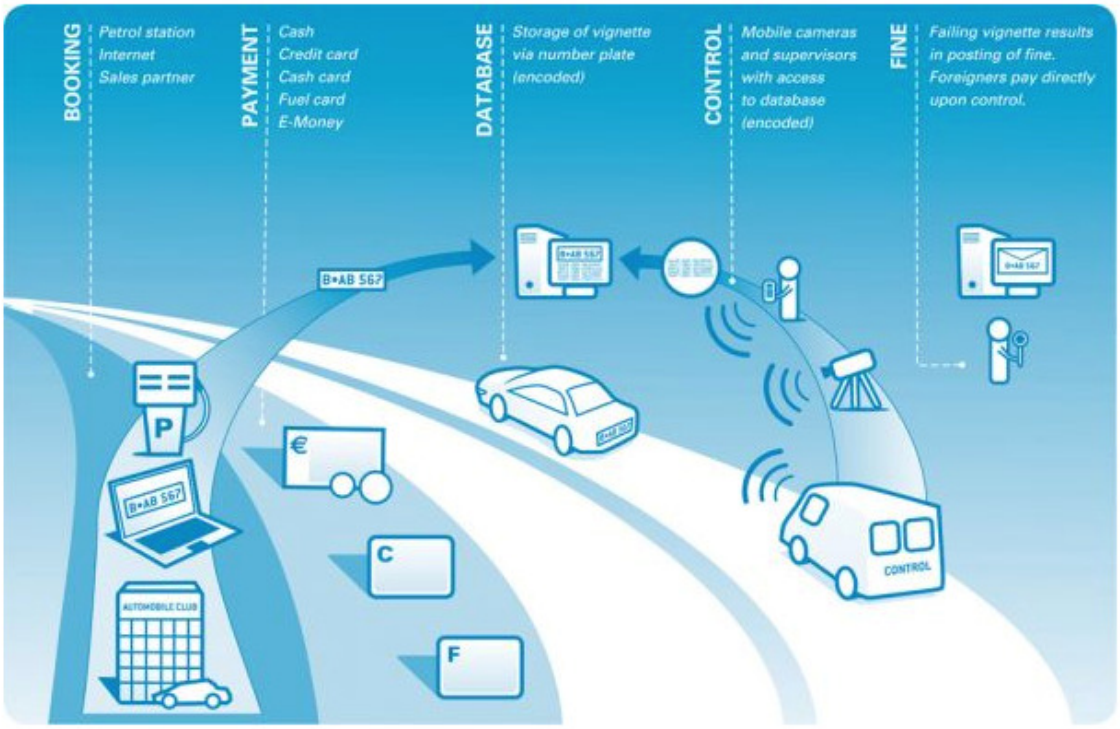
Time-Based Reconciliation Options

Since each jurisdiction would collect the RUC time permit directly from visitors, there would be no reconciliation required between bilateral jurisdictions. The only exception would be in the case of co-located RUC time permit kiosks or a jointly-operated website with a single payment gateway, which would require information sharing on revenue collected for and on behalf of each jurisdiction. This reconciliation could occur when the operator of the kiosks[3] and/or website reports revenues on a recurrent basis, with a split payment, one to each jurisdiction, for example monthly or quarterly.

AGES, a private company providing automated time permit services to heavy and light vehicles in Europe, serves as an example of an automated multi-jurisdictional time-based operational concept. The diagram below captures the key steps involved in booking a multi-jurisdictional time permit, known as an e-vignette, through AGES: booking by visitor, payment by visitor,

[3] The kiosks and website could be operated directly by a state-run RUC agency or by a vendor contracted by the RUC agency.

database entry by operator, control by law enforcement, and fine by law enforcement if found non-compliant. More information about AGES's e-vignette system is available at: http://www.ages.de/en/e-vignette.html.



3.3.5 Charge Based on Distance

For RUC based on distance traveled, options for reporting and reconciling comprise manual and automated methods as described below.

Distance-Based Reporting Options

- Manual (without location-based reporting). There would be no bilateral jurisdiction reporting in the case of manual declaration by visitors for RUC based on distance traveled because all visitors would be required to report miles directly to the jurisdictions in which they travel.
- Automated (with location-based reporting). Host jurisdictions would undertake no bilateral reporting for visitors. Visitors would travel on a host jurisdiction's roadways with the charge automatically computed and invoiced by their home jurisdiction, with subsequent reconciliation of the payment collected between the two jurisdictions for distance traveled on each other's roadways.

Distance-Based Reconciliation Options

- Manual (without location-based reporting). There would be no bilateral jurisdiction reconciliation in the case of manual declaration by visitors for RUC based on distance traveled, because all visitors would be required to report and pay for miles directly to the host jurisdictions in which they are traveling as a visitor.
- Automated (with location-based reporting). Visitors would pay for all miles traveled (in or outside of their home jurisdictions) directly to their home jurisdiction's RUC agency or private account manager. The account manager would apply the appropriate jurisdictional per-mile rate to the miles traveled in each jurisdiction. Bilateral jurisdiction reconciliation would occur on a recurrent basis as agreed between the two jurisdictions (e.g., monthly, quarterly, annual) and would be based on actual miles traveled by motorists from each other's jurisdiction, and actual distance-based charge rates in each of the two jurisdictions. This arrangement would require the two jurisdictions to maintain an agreement on reporting periods as well as updated per-mile rates to be used by the respective jurisdictions and/or private account managers.

3.3.6 Distance-Based, with Shadow Charges

This combination of policy alternatives would entail bilateral jurisdictions using an agreed combination of reporting and reconciliation methods and corresponding metrics for calculating differentiated and undifferentiated miles traveled by visitors.

Distance-Based + Shadow Charges Reporting Options

For reporting options, the bilateral jurisdictions would apply a combination of undifferentiated and differentiated distance charges:

- Undifferentiated distance charges. RUC payments would be reported based on the methods outlined above for shadow charges and based on approximated aggregate distance traveled in each jurisdiction.
- Differentiated distance charges. RUC payments would be based on the method outlined above for automated reporting of distance-based charges.

Distance-Based + Shadow Charges Reconciliation Options

For both distance-based and shadow charges the reconciliation process would be the same, whereby bilateral jurisdictions would make recurrent reconciliation payments based on the balance of distance traveled and difference in rate of distance-based charge.

Note: For bilateral jurisdictions comprising regions from Canada and/or Mexico, there would be the additional reconciliation requirements related to agreeing to the conversion factor for kilometres to miles, and currency conversions for the conversion rate, source, and update interval.

3.3.7 Distance-Based and Fuel-Based, with or without Shadow Charges

This combination of policy alternatives would comprise the same approach for reporting and reconciliation as distance-based with shadow charges with one key difference: the requirement to also estimate fuel consumption and, if done without shadow charges, to include fuel tax receipts in the reconciliation process between bilateral jurisdictions.

3.3.8 Distance-Based and Time-Based

This combination of policy alternatives would require use of reporting and reconciliation options that are a combination of those noted above separately for distance-based and time-based charges.

Distance- and Time-Based Reporting Options

Visitors with location-based reporting (differentiated distance) would report and make RUC payments to their home jurisdictions. All other visitors would be required to purchase time permits, and the bilateral jurisdiction reporting requirements would be the same as the alternative "charge based on time" described above.

Distance- and Time-Based Reconciliation Options

For distance-based charges for bilateral jurisdictions, the process for reconciliation would be the same as "distance-based charge" alternative described above. For visitors purchasing time permits, there would be no reconciliation required since each jurisdiction would collect the RUC time permit directly from visitors. In the case of a co-located kiosk or jointly operated time permit website, the reconciliation of time permit charges on a recurrent basis could be combined with the reconciliation of distance-based charges into a single transaction. Such a transaction would be facilitated if the entities conducting the reconciliation for time permits and distance-based charges were the same.

3.4 Multilateral jurisdiction reporting and reconciliation options

In an environment of multilateral jurisdictions, the notion of interoperability of reporting, reconciliation, and financial clearing comes into play. There are two general methods for such multilateral reporting, reconciliation, and financial clearing. The first is for more than two jurisdictions to report and reconcile distance charges in multiple pairwise (bilateral) agreements along the lines of the alternatives presented in the previous section. This is the "mesh" approach used in some interoperability tolling environments for light vehicles like E-ZPass in the Northeast United States and Liber-t in France. This approach requires *N!/(2*(N-2)!)* links among agencies and N-1 links for each agency. This is illustrated in the image at left, which depicts 5 agencies comprising 10 links, 4 for each agency.

However, a more efficient alternative is a "star" approach whereby there is a single agreement among multiple jurisdictions and a single clearinghouse that handles multilateral reporting, reconciliation, and financial clearing. This approach reduces the number of links for each agency to 1 and the total number of links in the network to N. The star approach is illustrated at left, depicting 5 agencies, each with 1 link, for a total of 5 links.

This section summarizes such a multilateral approach for RUC comprising an outline of the key options for reporting and reconciling RUC between more than two jurisdictions (multilateral jurisdictions) under the five policy bases and three combinations of policies. The logic of these concepts applies equally for any number of jurisdictions greater than two.

3.4.1 No Charge

Like for the case of bilateral jurisdiction, this is the status quo policy alternative whereby jurisdictions undertake no reporting of miles travelled for individual motorists. Thus, there would be no reporting, collection or reconciliation.

3.4.2 Shadow Charge

Like for the case of bilateral jurisdictions, this policy alternative would not comprise collection and payment from motorists since visitors make no payments and incur no administrative burden. Thus, the options described below relate solely to reporting and reconciliation.

Shadow Charge Reporting Options

To report and exchange information on estimated cross-jurisdictional travel between multiple jurisdictions (more than two jurisdictions, with or without a common border), the jurisdictions must agree on the methodology for estimating distance traveled by visitors on each jurisdiction's roadways. This includes the ability to estimate mileage for visitors at the aggregate and individual jurisdiction levels. The most practical and easiest approach would be to have one single methodology for all jurisdictions involved in a multi-jurisdictional environment. However, as described for bilateral jurisdictions, multiple methods could be utilized on a pairwise basis, with the following two main options for jurisdictions to collect and report data about distances traveled on its roadways by visitors:

- Agree and use of the same methodology for estimating cross-jurisdictional aggregated distance traveled, or
- Each jurisdiction reviews and agrees to the other jurisdictions' distinct methodologies.

Further details of the pairwise options (bilateral jurisdictions) for reporting options can be found in section 2.2.

The key to this alternative is that, even if there are unique agreements about mileage estimation methodology between pairs of jurisdictions, the overall multilateral jurisdictional agreement can remain in place, subject to the specific guidelines for estimating mileage between particular pairs of jurisdictions party to the agreement. For example, two jurisdictions connected by a tolling facility might agree to use data from the toll system as the basis for estimating cross-border travel, while adhering to a mileage estimation methodology based on FCD for other neighbors without toll facilities at the borders.

Shadow Charge Reconciliation Options

Since motorists would not be implicated in charges and subsequent multilateral jurisdiction reconciliation for a shadow charge, the options for reconciliation between multilateral jurisdictions would be limited to the jurisdiction level. Data on distance traveled by visitors would be collected by each jurisdiction and reported as noted above with two key reconciliation options:

- Distance traveled reporting and data are exchanged on a pairwise basis with financial clearing.

- Distance traveled reporting and data are exchanged with a clearinghouse that aggregates the distance traveled by visitors in each jurisdiction and calculates corresponding RUC rates to determine the total amounts owed from each jurisdiction to all other jurisdictions.
    - Like for the bilateral option, the computations would likely be the balance of travel between all pairs of jurisdictions based on the agreed methodologies, as well as any difference in the per-mile RUC rate and conversion factors, if necessary (e.g., km and foreign exchange rate).
    - A single transaction is made between the clearinghouse and each of the participating jurisdictions. This "transaction" could be in the form of information for financial clearing of the net revenue due or formal exchange of revenue in the event that the interoperability option entails financial clearing. In the former case, each jurisdiction that is not party to the financial clearing aspect of the multilateral arrangement could execute financial transactions with all other jurisdictions based on the reconciliation indicated by the clearinghouse.

3.4.3 Charge Based on Fuel Consumption

For this policy alternative, the host jurisdictions would collect fuel tax, as is the current situation. Consequently, there would be no reporting and reconciliation required between jurisdictions.

3.4.4 Charge Based on Time

For this policy for charge based on time and depending on the interoperability framework implemented, there are two key alternatives for a time permit program:

- Each jurisdiction runs its own time permit program (day, week, month, year) and collects payment directly from visitors, or
- There is a single clearinghouse operator of a time permit program for all participating RUC jurisdictions. The clearinghouse operator would provide time permits for multiple jurisdictions so that motorists visiting jurisdictions could make a single transaction for trips involving multiple jurisdictions. This works best via electronic permits, which can be issued virtually rather than paper permits which must be issued in person by each jurisdiction.

For RUC based on time, options for reporting and reconciling comprise jurisdiction-run time permit programs or a single clearinghouse operator program as described below.

Time-Based Reporting Options

- Jurisdiction-run time permit program. The same reporting options as for bilateral jurisdictions would prevail for this multi-jurisdictional environment when each jurisdiction implements its own permitting program, or implements a bilateral program.
- Single clearinghouse operator time permit program ("star" approach described at the start of this section). Host jurisdictions would undertake no reporting for visitors; however, host jurisdictions may want to use existing and new traffic counts to evaluate the program's efficacy. The clearinghouse operator would set up and maintain a time permit website for

all participating jurisdictions for motorists to pre-pay on-line for travel. Visitors would pre-pay (on-line, telephone, mail, etc.) for travel on host jurisdictions' roadways with the charge applied and collected by the clearinghouse operator. The clearinghouse operator would provide recurrent reporting of permits issued and revenue generated to all participating jurisdictions.

Time-Based Reconciliation Options

- Jurisdiction-run time permit program. Since each jurisdiction would collect the RUC time permit directly from visitors, there would be no reconciliation required, except for co-located RUC time permit kiosks and/or jointly-run bilateral time permit websites as explained in section 2.2.
- Single clearinghouse operator time permit program ("star" approach). Depending on the established framework for interoperability, the clearinghouse operator provides each participating jurisdiction their aggregated transaction information for financial clearing of the net revenue (that could then be done on a bilateral basis between all pairs of jurisdictions), or conducts a single transaction with each participating jurisdiction to reconcile funds owed or funds due based on the time permits issued and corresponding revenue in each jurisdiction during the reporting period.

3.4.5 Charge Based on Distance

For RUC based on distance traveled, options for reporting and reconciling comprise manual and automated methods as described below.

Distance-Based Reporting Options

- Manual (without location-based reporting). There would be no multilateral jurisdiction reporting option in the case of manual declaration by visitors for RUC based on distance traveled because all visitors would be required to report miles directly to the jurisdictions in which they are traveling.
- Automated (with location-based reporting). Jurisdictions would undertake no multilateral reporting for visitors. Visitors would travel on roadways outside their jurisdiction with the charge automatically computed and reported by their home jurisdiction and/or private RUC account manger. In the case of a single clearinghouse, the operator calculates all relevant distance charges and provides each participating jurisdiction their aggregated transaction information from RUC account managers for financial clearing of the net revenue due.

Distance-Based Reconciliation Options

- Manual (without location-based reporting). Like for reporting, there would be no reconciliation in this case.
- Automated (with location-based reporting). In the case of a single clearinghouse, the clearinghouse operator provides reconciliation based on aggregated and recurrent transaction information for all jurisdictions by conducting a single transaction with each

participating jurisdiction to reconcile funds owed or funds due based on the distance travelled and RUC rates in each jurisdiction. It should be noted that the financial clearing could also be done on a bilateral basis between some or all pairs of jurisdictions.

- Private RUC account managers. It is also possible that the private RUC account managers, should they operate in one or more jurisdictions, could act themselves as the clearinghouse, distributing funds to each jurisdiction based on the charges incurred by their customers in each jurisdiction. This would require each jurisdiction to have an agreement with each private RUC account manager, or for the private RUC account manager to have a single agreement with a multi-jurisdictional entity for RUC administration (similar to how IFTA operates for fuel tax administration) serving as an umbrella agreement with all participating jurisdictions.

3.4.6 Distance-Based, with Shadow Charges

This combination of policy alternatives would entail multilateral jurisdictions using an agreed combination of reporting and reconciliation methods and corresponding metrics for calculating differentiated and undifferentiated miles traveled by visitors from each participating jurisdiction.

Distance-Based + Shadow Charge Reporting Options

For reporting options, the multilateral jurisdictions would apply a combination of undifferentiated and differentiated distance charges:

- Undifferentiated distance charges. RUC payments would be reported based on the methods outlined above for shadow charges and based on approximated aggregate distance traveled in each jurisdiction.
- Differentiated distance charges. RUC payments would be based on the method outlined above for automated reporting of distance-based charges.

Distance-Based + Shadow Charge Reconciliation Options

For both distance-based and shadow charges there could be a single clearinghouse operator that does distance-based clearing across all participating jurisdictions whose motorists have location-based reporting. For all other motorists (undifferentiated distance charges), the clearinghouse also does a shadow charge as described above. The result of the two calculations can be combined into a single recurrent transaction for each jurisdiction with the clearinghouse.

Note: For multi-jurisdiction arrangements comprising regions from Canada and/or Mexico, there would be the additional reconciliation requirements related to agreeing to the conversion factor for kilometres to miles, and currency conversions for the conversion rate, source, and update interval.

3.4.7 Distance-Based and Fuel-Based, with or without Shadow Charges

This combination of policy alternatives would comprise the same approach for reporting and reconciliation as distance-based with shadow charges with one key addition: reconciliation calculation that is based on fuel consumption. It should be noted that this option may not be viable due to complexities associated with agreeing among multiple jurisdictions where fuel was purchased. If not done as a shadow charge, this option would also require the capture of reliable fuel purchase data from all motorists, which would be very costly to capture, if not impossible.

3.4.8 Distance-Based and Time-Based

This combination of policy alternatives would require use of reporting and reconciliation options that are a combination of those noted above separately for distance-based and time-based charges in a multi-jurisdictional environment.

Distance- and Time-Based Reporting Options

Visitors with location-based reporting (differentiated distance) would report and make RUC payments to their home jurisdictions. For visitors purchasing time permits, the multilateral jurisdiction reporting requirements would be the same as the alternative “charge based on time” described above.

Distance- and Time-Based Reconciliation Options

For distance-based charges for multilateral jurisdictions the process for reconciliation would be the same as “distance-based charge” alternative described above through the clearinghouse. For visitors purchasing time permits, there would be no reconciliation required since each jurisdiction would collect the RUC time permit directly from visitors. However, as described above, a multi-jurisdiction time permit system/function could be implemented under the time-based charge policy alternative.

3.5 Enforcement

Enforcement of compliance is an important component of multi-state RUC. There are at least two dimensions of enforcement. The first is to minimize opportunities for visitors avoid, game, or otherwise defraud home and host jurisdictions of their tax obligations. A second dimension is for states to monitor and enforce one another’s activities, as well as activities of vendors and private account managers involved in multi-state road usage charge collection and reconciliation. This memo addresses only the first dimension in detail.

This section provides an overview of key enforcement aspects related to individual motorists for each of the five policy alternatives as outlined below.

- No charge. This is the status quo policy alternative whereby visitors undertake no reporting of miles travelled to host jurisdictions. Thus, there would be no enforcement required.
- Shadow charge. This policy alternative would comprise no enforcement aspects, except for any enforcement associated with floating car data from visitors who selected location-based distance reporting in their home jurisdictions. However, no enforcement actions are required in host jurisdictions.
- Charge based on fuel consumption. This policy alternative, like the no charge alternative, would have no enforcement required since fuel consumption would not be reported and payment of charges is included in the price of fuel.
- Charge based on time. This policy would comprise several relevant and inter-related enforcement activities for visitors:
    - Roadside enforcement of visitors. Such enforcement activities would be carried out at border crossings, in particular, and any existing checkpoints such as agriculture stations in California. This enforcement activity would be best accomplished under an electronic time permit system with verification done via entry of license plate into a database that is then checked by an enforcement system (ALPR via fixed or mobile systems). Some considerations for a time permit system with paper stickers include:
        - Permit sticker location in the windshield.
        - Permit stickers for frequent multi-jurisdiction motorists could lead to windshields being encumbered with stickers.
        - Permit stickers would require fraud detection (mostly for counterfeit stickers) equipment and procedures, which could be very costly to implement and operate in comparison to electronic stickers.
    - ALPR equipment could be deployed strategically at or near border crossings (downstream of kiosks, if they exist) to identify license plates of visitors and run a check against paid permits, and send invoices/penalties to unpaid visitors.
    - Roadside and mobile enforcement could be deployed. Such enforcement activities would be most effective if the time-based charge comprised only electronic stickers, because it would allow the system to electronically determine compliance of visitors. For a manual system, it is likely that visitors could not be pulled over unless for another traffic violation or a “time permit spot check,” which would be expensive and would impede the flow of traffic.

- Charge based on distance. This policy alternative would comprise several potential overlapping and complementary options:
    - Visitors with approved location-based RUC reporting devices issues from their home state could be entered into a bilateral or multilateral system comprising a database of "compliant" visitors.
    - Visitors could be required to pay manual distance-based RUC to host jurisdictions. This approach would be hard to enforce because of the difficulties associates with identifying compliance vs. non-compliance. Furthermore, the legal basis for this type of enforcement could be difficult to define and implement. Enforcement strategies also depend on whether the manual distance-based RUC would be pre- or post-pay.
    - For both options noted above, ALPR could be used to identify visitors and facilitate enforcement of compliance on a more targeted group of motorists.

In summary, there are four key types of enforcement options that could be deployed:

- ALPR along the roadways,
- Mobile units with ALPR,
- Visual and/or automated enforcement at border crossings, and
- Roadside enforcement throughout the host jurisdiction.

Some combination of more than one type of enforcement should be considered. Overall, for all four options, ALPR would be the most effective automated solution to deploy because it would be more complete without impeding traffic. This approach would enable states to feel secure that, even though not all crossings are covered, most vehicles are being checked using automation.

4 Conclusions and Next Steps

The table below summarizes the five policy bases and three combinations of policies for charging for road usage by visitors.

Table 4-1 Summary of reporting, payment, and reconciliation approaches for policy alternatives

Activity / Policy Alternative	Individual reporting and payment	Bilateral jurisdiction reporting & reconciliation	Multilateral jurisdiction reporting & reconciliation
1. **No charge**	No reporting. No payment.	No reporting. No reconciliation.	No reporting. No reconciliation.
2. **Shadow charge**	No reporting. No payment outside of home jurisdiction.	Estimate distance traveled by visitors on each jurisdiction's roadways. Reconciliation limited to the jurisdictional level.	Estimate distance traveled by visitors on each jurisdiction's roadways. Reconciliation limited to the jurisdictional level pairwise or via a multi-jurisdictional clearinghouse.
3. **Charge based on fuel consumption**	No reporting. Payment of charges is done indirectly.	No reporting. No reconciliation.	No reporting. No reconciliation.
4. **Charge based on time**	Report presence in host jurisdiction and length of time. Payment via time permit.	Various means of reporting on time permits. No reconciliation between jurisdictions since RUC time permit collected from visitors directly, except in cases of a jointly-operated kiosk and/or time permit website with e-payment gateway.	Reporting. (1) Jurisdiction-run time permit (same reporting options as for bilateral jurisdictions) (2) Single clearinghouse operator of a time permit (host jurisdictions undertake no reporting). Reconciliation. (1) Jurisdiction-run time permit (No reconciliation except for co-located kiosks and/or jointly-run time permit websites) (2) Single clearinghouse operator of a time permit (jurisdictions receive aggregated transaction information for financial clearing of net revenue).
5. Charge based on distance	Report distance traveled in host jurisdiction. If automated and location-based, reporting happens automatically. If manual and/or non-location based, visitors must file trip reports indicating mileage of each visit to each jurisdiction. Payment for miles traveled to host or home jurisdiction.	Reporting. (1) Manual – no reporting since RUC collected from visitors directly. (2) Automated – RUC automatically computed and invoiced by home jurisdiction or private account manager. Reconciliation. (1) Manual – no reconciliation since RUC collected directly by host jurisdiction. (2) Automated – recurrent reconciliation as visitor pays RUC to home jurisdiction or private account manager.	Reporting. (1) Manual – no multilateral reporting since RUC collected from visitors. (2) Automated – RUC automatically computed and invoiced by home jurisdiction. Reconciliation. (1) Manual – no reconciliation since RUC collected by host jurisdiction. (2) Automated – jurisdictions receive aggregated transaction information from clearinghouse for financial clearing of the net revenue.

Activity / Policy Alternative	Individual reporting and payment	Bilateral jurisdiction reporting & reconciliation	Multilateral jurisdiction reporting & reconciliation
6. Distance-based with shadow charges	N/A	Reporting. (1) Undifferentiated distance charges – Same as for shadow charges and based on approximated aggregate distance traveled in each jurisdiction. (2) Differentiated distance charges – Same as for automated reporting of distance-based charges. Reconciliation is same for distance-based and shadow charges – bilateral jurisdictions make recurrent reconciliation payments based on the balance of distance traveled and difference in rate of distance-based charge.	Reporting. (1) Undifferentiated distance charges – Same as for shadow charges and based on approximated aggregate distance traveled in each jurisdiction. (2) Differentiated distance charges – Same as for automated reporting of distance-based charges. Reconciliation. For both distance-based and shadow charges – single clearinghouse operator that does distance-based clearing across all participating jurisdictions.
7. Distance-based & fuel-based, with or without shadow charges	N/A	Same approach for reporting and reconciliation as distance-based with shadow charges. Difference is requirement to estimate fuel consumption and include fuel tax receipts in the reconciliation process.	Same approach for reporting and reconciliation as distance-based with shadow charges. Difference is requirement for reconciliation calculation based on fuel consumption.
8. Distance-based and time-based	N/A	Reporting. (1) Differentiated distance charges – RUC payments to home jurisdiction. (2) Others purchase time permits with reporting same as charge based on time. Reconciliation. (1) Differentiated distance charges – same as distance-based charge. (2) No reconciliation for time permits.	Reporting. (1) Differentiated distance charges – RUC payments to home jurisdiction. (2) Others purchase time permits with reporting same as charge based on time. Reconciliation. (1) Differentiated distance charges – same as distance-based charge. (2) No reconciliation for time permits.

Immediate next steps include cost and revenue analysis of the multi-jurisdictional RUC alternatives, consideration of international RUC alternatives, and analysis of existing programs. Remaining questions to answer include the following:

- How much cross-border travel exists in the various jurisdictions?
- What are the revenue implications of multi-jurisdictional RUC, i.e., how much revenue do individual jurisdictions stand to gain or lose if they do not have agreements with their neighboring jurisdictions?
- Along the same lines, what are the costs associated with setting up and operating any of the above alternatives for multi-jurisdictional RUC reporting and reconciliation? How effective and costly will the enforcement be in a multi-jurisdictional environment?
- How can the basic premise of multi-jurisdictional RUC be operationalized in the U.S. between states as well as internationally between U.S. border states, Mexico, and Canada?

- What programs exist today in the jurisdictions that could be used as the basis for a future multi-jurisdictional RUC program? We have conducted a preliminary analysis of several programs that could serve as models.

We have outlined a range of policy alternatives and operational concepts from the perspectives of individual motorists as well as jurisdictions. Notionally, the list below summarizes some implementation steps that could be pursued in further developing any of these alternatives into an operational solution for a multi-state RUC environment:

- Develop and prepare templates of inter-governmental agreements necessary to implement multi-state RUC with possible cost and revenue sharing options.
- Agree to an organizational home of any clearinghouses or multi-jurisdictional vendors necessary for the implementation and operations of any of these alternatives, e.g., regional entities such as IFTA.
- Inter-governmental decision on approach to interoperability and clearinghouse functions:
    - Mesh approach (described in 3.4) with pairwise agreements and clearing.
    - Star approach (described in 3.4) with clearinghouse for
        - Reporting
        - Reconciliation
        - Financial clearing (option to have bilateral recurrent clearing)
- Technical agreements on how data and information will be collected and exchanged.
- Establish and agree upon business rules.
- Set up and functional elements requirements
    - Data collection and computation in terms of funds exchange; and,
    - Calculate who owes what based on business rules
- Financial clearing: pairwise or via the clearinghouse.

We find that multi-jurisdictional RUC is feasible, and many alternatives exist for its implementation, operations, and enforcement across a range of policy bases and combinations of policies. However, not all of the alternatives may be desirable, and jurisdictions may prefer varying approaches. Given the likelihood of diverse policies toward motorists across jurisdictional borders (e.g., fuel tax in one, RUC in the next, shadow charges between some pairs, time permits), a multi-jurisdictional scheme must be flexible to accommodate a range of policies for coordinated operations and enforcement that evolve over time. For example, the easiest approach for an early adopter of RUC may be to keep fuel tax in place for visitors while allowing visitors to opt in to a time- or distance-based approach. The need for flexibility is particularly critical for the first several jurisdictions that attempt to implement RUC, whether alone or in collaboration through mechanisms like those described in this document.