Road usage charging is not tolling

How the differences between the two can be leveraged to help pass road usage charging legislation, by Jack Opiola, Steve Morello, Travis Dunn and Matthew Dorfman

Payment for use of limited access road infrastructure (roads, bridges and tunnels), or tolling, is nothing new. In fact, it predated the Roman Empire. It was a common means of paying for turnpike construction and maintenance in the United States and across Europe in the 19th Century.

However, as motorized vehicles became popular in the 20th Century, motor fuel taxes overtook road tolls as a preferred revenue mechanism to pay for road infrastructure due to their much lower cost of collection than tolls and their viability as a proxy to road usage. In recent years, fuel tax revenues have fallen due in significant part to increasingly fuel-efficient vehicles, prompting discussions about the need for another innovation in the way users should pay for their usage of road infrastructure.

Among the candidates are traditional tolling and Road Usage Charging (RUC), which charges motorists based on distance driven (miles or kilometers) on all roadways. Unfortunately, because RUC and tolling evolved from the same need – that users pay for the facilities they are driving on – it is easy to conflate RUC and tolling. That is a mistake! Tolling is a revenue collection model well suited to financing the specific infrastructure on which the tolls are collected. RUC, in contrast, is best-suited providing financing for roadway infrastructure and mobility for a large area, such as a state.

In the US, several blue ribbon panels and agencies such as the Government Accountability Office and the Congressional Budget Office have recommended exploring Road Usage Charging as a means to make road revenues resilient to increasing vehicle fuel economy and use of alternative fuel vehicles such as electric, plug-in hybrid electric, natural gas (CNG/LNG), and advanced hybrid cars.

First among equals

In July 2013, Oregon became the first State to pass a law enabling RUC; however, Oregon is a state without tolling. It did not treat RUC like tolling, but as a unique revenue source. This paper examines the differences between RUC and tolling, and shows how understanding the distinctions can aid in the development and enactment of RUC legislation.
“Due in part to the technological milestones marking the evolution of revenue collection, the lines between various revenue collection policies – tolling and road usage charging – may seem to have blurred”

Over the past 50 years we have seen toll collection progress from manual to mechanical to semi-automated (eg, coin and card machines) to fully automated (eg, tag-and-beacon DSRC and video systems). For customers, this evolution has gone from "stop, wait, and go" to "pause and go" to, most recently, “free flow” (or all-electronic tolling) through tolling points or gantries. Many believe that by coupling wireless communications with location-based services enabled by global navigational satellite systems, we have already journeyed into a world capable of virtual tolling anywhere, anytime and any day.

Due in part to the technological milestones marking the evolution of revenue collection, the lines between various revenue collection policies – tolling and road usage charging – may seem to have blurred. Some writers have used the terms ‘tolling’ and ‘road user charging’ more or less interchangeably. We disagree. The purpose of this article is to clearly define the similarities and differences between the two concepts. Understanding the differences can help policymakers develop successful RUC business models and pass RUC-enabling legislation.

SIMILARITIES
Road user or usage charging and tolling have many similarities. Both include collection of revenues for usage of roads or facilities. The collection of tolls and road usage charges involve account management and options for payment. Both are intended to raise revenue for transportation purposes, often dedicated to the roads from which they are collected. Both may use manual, semi-automated, or fully automated services and technologies to assist in the collection of payments. Both involve compliance and enforcement measures to ensure acceptable levels of revenue are captured. Both require customer service be provided for the toll or charge payers. Both concepts also influence motorists to plan their trips and modes of travel more effectively. The most important similarity between tolling and road usage charging is that both have the goal of generating revenues.

Road usage charging and tolling are similar, but different. They differ, though, in how revenues are spent. For tolling, the primary use of toll revenues is for design, construction, operations and maintenance, and debt servicing of the tolled road for a specific period of time usually measured in decades. The profits of toll operations are usually reinvested into road expansions and other facility enhancements, if owned and operated as a government facility. Private toll road profits can be used as investments in other facilities in the same geographic area or elsewhere in the world. Road usage charges or RUC, on the other hand, are collected from all roads in a geographic area or jurisdiction such as a state or province. Like fuel taxes, revenues are meant to pay for the upkeep, enhancement and expansion of the entire non-tolled road network and mobility in the jurisdiction.

DIFFERENCES
From the similarities between RUC and tolling, it is easy to conflate the two concepts and conclude that they are two instances of the same policy, to be treated similarly. However, the two concepts diverge radically in other ways:

- Scale
- Rate
- User choice
- Technology
- Suitability for value-added services

The most striking difference is scale. Even in jurisdictions that have many toll facilities, tolling covers a small proportion of the entire road network. Tolling typically involves a specific road, bridge, or tunnel. In some cases these toll facilities may intersect or be connected to form a series of roads that each collects a toll. I-95 in the Northeast of the US or the French toll road system are examples of networks of toll facilities.

One consequence of the difference in physical scale of the two systems is that the overhead cost of collection for tolling technology (toll tag readers, enforcement cameras, classification equipment, etc.) for tolling systems does not scale down as the system is expanded, whereas the cost of IT for RUC does scale down. That is because RUC simply requires storage and computing power – little or no roadside infrastructure. Tolling would be prohibitively expensive to implement on all but the roads and highways with the highest traffic levels, whereas RUC can be implemented on all roads in a state.

In addition to scale in size, the number of users of toll facilities in a state is relatively small compared to the entire vehicle population in a state with road usage charging.

NOTE
1 Florida Transportation Indicators, Florida Department of Transportation, Office of Policy Planning, 2009.
2 ibid
There are many more trips in any region on non-tolled facilities [than on tolled facilities]. Road usage charging would include all trips by all RUc-subject vehicles in the state because all state-registered vehicles (cars and trucks) would be subject to a road usage charge. Tolling represents a small number of trips in any geographic area – there are many more trips in any region on non-tolled facilities. Road usage charging would include all trips by all RUC-subject vehicles in the state.

As an example of the difference in scale, Florida, a state with a well-developed toll road network, has 750 center-line miles of toll facilities compared with 12,084 centerline miles of highways and 121,386 centerline miles of roads altogether. Since road usage charging would be collected across the full network, it would cover 161 times more miles than tolls in Florida. Moreover, there are approximately 16m vehicles in Florida. Considering an annual mileage for each vehicle, this is almost 2 billion miles of annual travel miles that would be subject to a road usage charge, if all vehicles were subject to RUC.

The second difference – in light of the much larger scale of RUC relative to tolls – is that the per-mile charges for RUC are much smaller than on toll facilities. Toll rates vary, but operators typically charge on the basis of a segment or for use of the entire facility. When divided by the distance driven, tolls often equate to a per-mile charge often above US$0.10 per mile and as high as $0.50 and even over US$1.00 per mile for point-based or special facilities such as tunnels and bridges. The state average in Florida is approximately US$0.15 per mile. North Carolina is averaging US$0.15 per mile with ETC payments and US$0.24 per mile for video or cash payments.

California, a state that moved to tolls more recently, has a higher average of US$0.32 per mile. A spreadsheet illustrating this point is available by emailing the editor of this publication at kevin@h3bm.com. By contrast, RUC pilots have tested rates with a smaller order of magnitude of US$0.01 to US$0.02 per mile, which is fairly consistent with fuel taxes as a proxy for RUC. Considering the rate and the average number of miles driven in a year, most drivers would face an annual RUC bill on par with what they currently pay in fuel taxes, between US$200-300 per year.

A third difference is the presence of user choice. Toll road users choose to take a toll road. They generally have the option of a toll road and the public or state road to choose for their journey. The toll road may provide higher value and timesavings to attract users from using the alterante or parallel un-tolled roads. When road usage charging legislation is passed, every vehicle (or every member of a class of vehicles subject to RUC) that uses or drives on any road must pay the road usage charge. There are no free roads! Hence, the user choice would be to choose whether or not to make a trip, and if so, what the best transport mode would be to make those trips.

In modeling performed by Imperial College London, UK, and by the Southern California Association of Governments, road usage charging would suppress 8–14 per cent of all journeys by eliminating “low-value” trips. [Archer and Glaister, Investing in Roads: Pricing, Costs and New Capacity, November 2006]. These trips are generally chained into a single trip of multiple purposes or users change mode of travel, including cycling and walking for short distance trips. Additionally, they just don’t make the trip due to its low value in the mind of the user.

The fourth difference between RUC and tolling is the potential for using revenues for bonding future projects. Bonding against toll revenues is typically allowed to pay only for the toll facility. Bonding against RUC would be similar to states that bond against the gas tax today – the bonds can be used to pay for all transportation costs in all parts of the state. Tolling bonding capacity is also limited by traffic risk on a given facility, while RUC bonding capacity would be limited only by economic indicators for a given state – the same as the gas tax. Once RUC revenues would grow as large and steady as gas tax revenues, this means much lower risk and therefore lower cost of borrowing than can be achieved with tolling and the dwindling revenues from gas taxes.

DIFFERING TECHNOLOGIES
A fifth difference between the two concepts is the technology to implement the charges. Tolling has evolved to use ETC tags or transponders, video capture of license plates, and roadside infrastructure to read the passage of vehicles through tolling points on the road. The system requires roadside technology (and to a large extent in-vehicle technology) to operate and identify a vehicle and the charges to be billed to a user's account.

Scaling up tolling infrastructure to cover an entire road network in a state or region is cost prohibitive. Instead, road usage charging employs technology that reads either the vehicle miles or calculates them independently, stores the data and then communicates it to the account manager over-the-air. It can also be based on periodic self-reporting or verified reporting of the vehicle odometer. All miles driven between the two odometer readings are charged. Technologically, the approaches available for RUC scarcely resemble tolling.

One final difference between tolling and road usage charging is that tolling technologies are typically stand-alone applications, not providing services other than tolling.
"Any assumptions about RUC based solely on the fact that a RUC system is similar to a tolling system should be challenged"

While some value added services have been used with tolling technologies, these services have been localized, typically for payment or off-street parking and some roadside services such as fast food. In the USA, where tolling systems are not interoperable and are proprietary or "closed" systems, few value added services are offered. Road usage charging, on the other hand, due to its potential scale and application to all RUC-subject vehicles, is more suited to building on existing value added services that include pay-as-you-drive insurance, vehicle concierge services, vehicle maintenance information, virtual emissions inspections, parking, and even payment of tolls.

**IMPACT OF DIFFERENCES**
The differences between RUC and tolling impact how a RUC program should be developed and implemented. Three strongly impacted areas are:

- messaging to the public,
- engagement with legislative bodies, and
- interaction with technology and business service providers.

First, messaging to the public must occur on a much larger scale than typically occurs with tolls. Most toll system outreach and interaction occurs in the metropolitan area where the tolls are located. RUC outreach must be performed across an entire region, state or country, as it will affect every road user in the jurisdiction and even beyond, if RUC will be imposed on out-of-state drivers as well.

When engaging the public, there are several messages that should be delivered to explain RUC. First, the benefits of implementing RUC (sustainable revenues, equity across all socio-economic classes, more fair allocation of costs, etc.), and whether it will be used to replace or supplement the gas tax, should be explained in a public forum, providing the public with ample opportunity to gain a better understanding of RUC and provide feedback. The public should be informed that RUC will have no impact on existing tolls. Next, the public should be told which vehicles the RUC will apply to – all, or just a subset. Finally, the public should be told the general range of the price of the RUC, even if the precise per mile rate isn’t known. It should be emphasized that the RUC rate will be US$0.01-0.02 per mile, or US$150–250 per year for most vehicles, depending on how far you drive.

Introducing RUC requires a unique type of engagement with the legislature that differs from engagement for tolling policies. Legislators from the entire state should be engaged, as RUC will impact everyone. All legislators should be made to understand that the basis for a RUC policy is creating sustainable revenues for statewide mobility. In contrast, the basis for tolling is being able to build a dedicated facility in a specific location/local jurisdiction. Legislators should understand some of the basic policy issues related to RUC, especially:

- Increasing fuel efficiency combined with the emergence of alternative fuel vehicles make the gas tax unsustainable as a user fee;
- RUC’s per-mile charge is the basis of road usage; gas tax was always just a proxy for road usage;
- RUC does not harm rural drivers disproportionately compared with urban drivers, because rural drivers are already paying disproportionately more through the gas tax. RUC preserves the equity of the current financing system. This is especially important, as all legislators, including those from rural districts, should be engaged in the support of RUC; and
- RUC is more cost-effective than tolling and has more bonding capacity than tolling when applied statewide. In fact, it could help raise a state’s bond rating compared to its ratings with the gas tax – ratings agencies have already identified decreasing gas tax revenues as a major risk that could impact gas tax bonding capacity.

Finally, technology and business service providers (account managers) for RUC should be treated differently from those that provide tolling services. The larger scale and scope of the RUC is conducive to private account management (instead of account management directly by state agencies). Moreover, RUC bundles neatly with existing technology and value-added services such as pay-as-you-drive insurance and in-vehicle telematics systems (such as GM’s OnStar or Toyota’s Entune), both of which make the system cost-effective and convenient for the user.

The larger scale also makes it more important for the RUC system to be an open system (in which technology and service providers can enter the system with low barriers, and multiple providers can be active in one jurisdiction) instead of a closed system (in which one company or toll agency controls technology and others cannot enter). Tolling systems have traditionally been closed and only recently have begun to open to multiple providers supplying hardware that interacts. Lastly, companies should be enabled and encouraged to use the flexible RUC technology platform to provide additional value added services.

**CONCLUSION**
Understanding the substantial differences between road usage charging and tolling is the key to creating the politi-
Opinion piece

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D’Artagnan Consulting LLP is a partnership of
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the modern era of ITS and RUC including mileage-
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interoperability of electronic tolling, and value added
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policy analysis and advice, market reviews (including
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opinions, economic theory of road charging, marginal
social cost analysis for RUC projects, and program
implementation consultancy support.

The technical and business relationships needed to pass RUC-enabling legislation and start a successful RUC program. It would be a poor fit for a single road, toll facility such as a bridge or tunnel, or as a sub-regional charge within a state. Tolling, on the other hand, is an excellent means for financing a specific road or facility, but it is ill-suited to providing revenues for the roadway infrastructure of an entire state – exactly what RUC is designed to do.

Any assumptions about RUC based solely on the fact that a RUC system is similar to a tolling system should be challenged.

RUC will likely occur on a much larger scale than tolling, potentially involving much larger sums of money, and thus necessitating outreach to citizens and legislators across a state or multi-state region. These citizens and legislators should appreciate that RUC per mile rates will be much lower than tolling rates and that RUC will have overhead costs of operations that are significantly lower than tolling.

When these facts and others are used to pass RUC-enabling legislation, RUC has great potential to make transportation infrastructure revenues resilient to increasing fuel economies and the changing dynamics of the future vehicle fleet, allowing for renewed investment in roadway infrastructure.

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