Tolling Lessons Learned for Road Usage Charge

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Project Objective

Even though plug-in electric vehicles can reduce the problem of greenhouse gas emissions from the transportation sector, externalities like congestion and road damage will exist. Therefore, state transportation agencies will need pricing mechanisms like a per-mile road user charge (RUC) to deal with these externalities while accounting for the transition to an EV-dominated fleet. In this project, focusing on electronic toll collection (ETC) methods, we aim to conduct a thorough review of lessons learned from established tolling systems across US states and the tolling system in Singapore and London. Post literature review and expert interviews, a multi-criteria performance framework of different tolling mechanisms will be formulated based on criteria such as accuracy of data collection, complexity for regulators and users, compatibility across policy objectives (primarily RUC), and equity.

Problem Statement

Other than the fuel tax system, road tolling is the only other pricing mechanism implemented in the US and other cities like London, Stockholm, and Singapore. While priced managed lanes or corridor tolling is more common in the US (some corridors have dynamic pricing to control congestion), Singapore and London have cordon tolling/area-based pricing. Implementation of these tolling and RUC systems may share many similar administrative and technical issues –issues related to data collection and transfer with onboard units (OBUs), geo-fencing, telematics, etc., the error potential of these data collection methods, the administrative cost of collection of tolls or user fees, interaction with other policies like carpooling or congestion pricing, data privacy and security. In this project, focusing on electronic toll collection (ETC) methods, we aim to conduct a thorough review of lessons learned from established tolling systems across US states to address two primary goals 1) to investigate existing tolling practices following the steps mentioned above and 2) to provide a policy memo that can aid policymakers in setting up and implementing an RUC program, should elected officials decide to do so.

Research Methodology

To accomplish our objective, we used a two-pronged analysis approach, where we began with conducting semi-structured interviews and identifying themes from our interviews. The second piece of our analysis leveraged the thematic findings from the interviews to inform the evaluation criteria in the multi-criteria decision analysis (MCDA). To provide more details on both methods, we first designed a predefined set of questions that cover the overlapping aspects between the tolling industry and RUC, namely system operations, finances, data collection and handling, and technology etc. The semi-structured nature of the interviews offered the interviewees the full range of responses, and it also allowed us to ask follow-up questions to elicit more information. Over the five-month period, we conducted nine interviews with eleven interviewees who have worked in California, Ohio, Oregon, Texas, Utah, and Washington. Most of these States have implemented a RUC program or have conducted a RUC pilot, except for Ohio and Texas. After we finished conducting and transcribing the interviews, we reviewed the transcripts for accuracy. We then applied thematic coding on the transcripts, where we identified key themes that emerged from the interviews and grouped responses according to the key themes. In doing so, we deconstructed the transcripts into the following key themes: technology, operations, data, revenue leakage, equity, interoperability, and rate design. Once

the key themes were formed, we collected data on interviewees' sentiments and positions around these key themes.

Following the interview analysis, we conducted a MCDA to evaluate how well the State-level RUC pilot projects conducted to date can integrate with tolling systems. MCDA is often employed by governmental agencies to evaluate alternatives in their decision-making process (Department for Communities and Local Government 2009)[1]. Additionally, MCDA helps decision makers recognize the trade-offs among the alternatives, which is extremely crucial in the exploratory stage of tolling-RUC integration. To operationalize a MCDA, we first reviewed reports on RUC implementations from California, Colorado, the Eastern Transportation Coalition, Hawaii, Minnesota, Oregon, Utah, and Washington. By comparing the objectives from these reports to the key topic areas identified from our interviews, we constructed a value tree that reflects the shared objectives in a RUC-tolling integration. After identifying the objectives, we selected specific and measurable evaluation criteria for each value branch. These criteria were selected via identifying the commonly mentioned themes by our interviewees and identifying the overlaps between them and the findings from the reviewed RUC reports. Lastly, we collected data on each criterion from the RUC reports and evaluated each of the abovementioned States on their preparedness on integrating tolling with RUC.

Results

Table 1 below gives the evaluation of eight RUC programs with '5' indicating the program has well-accounted for the characteristics in their RUC program design to integrate with tolling while '1' indicating that the characteristic was considered but not adequately. 'N/A' indicates that there was no data regarding the characteristic in the report we evaluated.

Table 1. Evaluation of each abovementioned State's RUC program or pilot against the criteria identified in the value tree.

	Revenue Generation			Equity		Technology Feasibility		Public Acceptance			Autonomy	
	Collection Costs	Administrative Costs	Enforcement Costs	Affordability	Accessibility / Inclusiveness	On-road Tech	Back-office Integration	Data Privacy	Usability / Awareness	Payment Flexibility	Interoperability	Data management / Ownership
California	3	5	4	3	3	5	4	5	5	3	4	4
Colorado	3	3	4	3	4	4	5	4	5	3	3	3
Eastern Transportation Coalition	4	4	4	5	4	4	5	4	5	2	5	5
Hawaii	4	4	3	4	4	5	4	5	5	3	2	2
Minnesota	3	3	3	3	2	3	5	4	4	2	4	3
Oregon	3	4	4	4	4	3	5	4	4	3	4	4
Utah	4	4	4	4	3	4	4	5	5	4	3	4
Washington	4	5	4	3	4	5	5	4	4	3	4	5

[1] The Department of Communities and Local Government: London. (2009). Multi-criteria Analysis: a manual. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/7612/1132618.pdf

The insights obtained from our analysis provides invaluable lessons-learned in terms of the functioning of the tolling systems. While as an industry, there are some common practices and standards across tolling systems, different tolling agencies have tailored their technology and operation to meet the needs of their users. This is a major takeaway for RUC in terms of designing a program that has clear objectives of revenue generation for funding infrastructures, while allowing enough flexibility to handle regional differences. Another key takeaway is managing revenue leakage in the transition from a "pay now" to a "pay later" model when moving from motor fuel tax to RUC. Some potential safeguards of revenue leakage include partnering with the State's Department of Motor Vehicles (DMV) to streamline the process of data request and account matching, so the accuracy of transactions matching to accounts increases. Another area of exploration is leveraging in-vehicle telematics to directly communicate with existing tolling technology in terms of mileage tracking. Technology implementation and handling revenue leakage are areas of expertise that the tolling industry has, which can be greatly leveraged to widely implement a RUC program. In terms of collaboration between the tolling industry and RUC, there is potential consolidation of back-office account management. Instead of creating a different customer service center that assists users with payments and processes transactions for billing, RUC implementation should consider leveraging the existing staffing and system infrastructures of the tolling industry. Lastly, an area that is highly relevant in rate design and administration of RUC is ensuring equity in terms of alleviating financial burdens on low-income populations and ensuring that unbanked and underbanked populations have the means to pay for their RUC. Timely research on equity in rate-design is invaluable and essential in a successful RUC implementation.

The full report, "Tolling Lessons Learned for Road Usage Charge", can be found at https://doi.org/10.7922/G23R0R6M.