Moving to Our Future:

Pricing Options for ***Equitable Mobility***

PBOT
PORTLAND BUREAU OF TRANSPORTATION

Tolling: Background Memo

September 9, 2020

Prepared for the Pricing Options for Equitable Mobility project by PBOT's Policy, Innovation and Regional Collaboration Team to inform Community Task Force discussions

Contents

Introduction

Tolling involves charging a direct fee to a vehicle for using a roadway facility, such as a highway, bridge or tunnel. Unlike pricing strategies such as fuel taxes or vehicle miles traveled (VMT) charges, tolls are applied to a specific facility and only charged to users of that facility.

Oregon has limited history with tolling.[1] Tolls have been used a few times to fund bridge projects across the Columbia River, including the construction of the I-5 Bridge (tolls removed in 1966), the Astoria-Megler Bridge (tolls removed in 1993), the Bridge of the Gods ($2 toll still charged) and the Hood River Bridge ($2 toll still charged).[2] But beyond these examples, Oregonians are generally unfamiliar with the concept of paying a user fee to access road infrastructure when traveling within the state.

Tolling has become a topic of much greater interest in the Portland region over the past few years as we experience growing demand for our roadways, increasing congestion, growing inequities in our transportation system, an accelerating climate crisis, and concerns over the long-term viability of our transportation funding systems. Our region is not alone in looking at tolling. Many places, like the East Coast, have had toll roads for decades. Cities like Seattle, Minneapolis and Los Angeles have started to use tolled facilities both to raise revenue and to tackle congestion, and many other places around the country and world are looking more closely at tolling as a tool to manage demand.[1]

Context: Regional Conversations around Tolling

In 2017, the Oregon Legislature directed the Oregon Transportation Commission (OTC) to seek federal approval to implement tolling on I-5 and I-205 in the Portland Metro Area to address congestion through the passage of House Bill 2017 ("Keep Oregon Moving").[3] The Oregon Department of Transportation (ODOT) conducted a feasibility analysis between 2017 and 2018 to identify and explore different tolling scenarios on these highways. Through this process, ODOT engaged the public to identify priorities and convened a Policy Advisory Committee (PAC) of regional stakeholders to inform the development of tolling alternatives. The City of Portland served on the PAC.

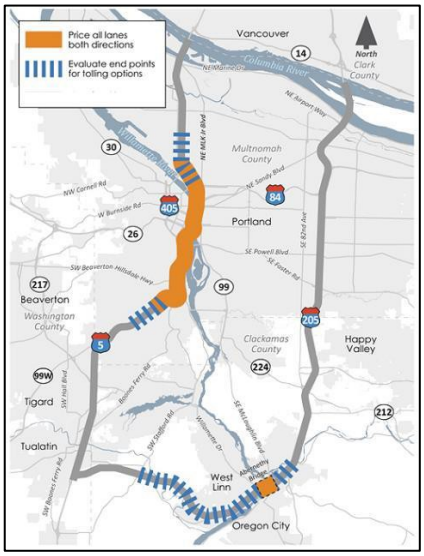


Figure 1: Proposed ODOT Tolling Projects

At the end of the feasibility analysis, the OTC submitted a request to the Federal Highway Administration (FHWA) to conduct further environmental analysis on its proposed tolling projects on I-5 and I-205. The alternatives that advanced from the feasibility analysis include (Figure 1):

- Tolling all lanes on I-5 between the SW Multnomah Boulevard exit and the N Going/Alberta Street exit
- Tolling all lanes on I-205 on or near the Abernethy Bridge

The City of Portland expressed qualified support for these projects moving to the next phase of analysis, while outlining policy objectives the City would want to see met in any pricing program[4], including:

- Prioritizing the objective of managing demand

[1] In this context, "demand management" refers to placing a price on the use of a roadway facility to send a signal to users that the space—or "supply"—is scarce, which causes users to weigh up the value of using that facility or changing their behavior (e.g. traveling at a different time, carpooling, or taking a different mode).

- Matching any pricing strategy with transit improvements
- Leading with equity in the design of pricing strategies, not just mitigating the potential negative impacts on disproportionately impacted communities
- Maintaining or improving safety of the transportation system
- Generating environmental and health benefits, such as reduced CO_2 and particulate emissions

ODOT is proceeding with the environmental review process with these projects, leading with the I-205 project. The stated purpose for the projects is to manage congestion and generate revenue for congestion relief. The I-205 toll project is specifically tied to a proposal to add lanes to the highway in a section near and on the Abernethy Bridge.

While much of the regional conversation to date is focused on the I-5 and I-205 tolling projects, it is likely that there will be further discussions in the coming years about using tolling on other facilities to manage demand and/or raise revenue. For example, talks are restarting around replacing the I-5 Bridge over the Columbia River, and tolling is likely to be a key part of the conversation as the last iteration of the effort (the "Columbia River Crossing project" which ended in 2013) called for tolls to finance construction and Metro's Regional Transportation Plan (RTP) assumes the bridge will include tolling. The OTC also asked that ODOT look at scenarios for comprehensive tolling of the freeway system in the region.

Key Questions for Pricing Options for Equitable Mobility (POEM) Task Force

The City of Portland has adopted plans and policies calling for the exploration of tolling on facilities within the city as a demand management strategy, including in the Central City Plan. Portland's recent Climate Emergency Declaration also said the City "will require the implementation of demand management strategies, implemented equitably and in close collaboration with BIPOC communities, before any future freeway construction or expansion project."

Research conducted by City staff over the past several years while engaged in regional conversations around tolling has informed the City's current stated positions and hypotheses around tolling as a demand management tool:

- The "status quo" of our transportation and mobility system is inequitable and unsustainable. Portlanders today are paying to use our roadways in non-monetary ways (pollution and climate impacts, economic impacts, lives lost to traffic violence, lost time, health impacts and more). Many of these costs hit our most vulnerable community members hardest.
- Highway expansion—meaning the increase of roadway capacity on highways by adding additional lanes or miles—is extremely expensive and benefits auto users over those who cannot afford to drive. Expanding highways is a short-term fix for congestion and is proven to induce more driving, thus exacerbating the costs of the current transportation system. Expansion is also paid for mostly by gas tax and vehicle registration fees, which are both regressive. Highway tolling should be evaluated as a tool to manage demand on roadways before expansion.
- Tolling systems should be designed to advance equity, climate and safety goals (equitable mobility) including through dynamic pricing and potential discounts/rebates/exemptions
- Toll revenue should be prioritized toward improving equitable and sustainable non-auto transportation options (e.g. transit) to the extent allowable by law.

Questions for further exploration with the POEM Task Force include:

- Using the Equitable Mobility Framework as a guide, what opportunities might tolling offer to advance equitable mobility across the things we care about?

- What questions or concerns would we want addressed when evaluating tolling programs?
- What should be prioritized when designing tolling systems and allocating toll revenue in order to further advance equitable mobility?
    - Potential discounts/exemptions/rebates
    - Use and oversight of revenue
    - Dynamic vs flat pricing models
    - Regional vs more localized applications of tolls
    - Complementary strategies (i.e. other investments in the transportation system introduced alongside tolling)
- Is there agreement with the City's current positions around tolling, stated above, that exploring tolling is more equitable than the "status quo" and continued expansion of highway capacity without pricing.

Why Implement Tolling?

Government agencies generally use tolling for two primary functions[5]:

1. To recoup the cost of road construction or maintenance
2. To manage demand on congested roadways

These objectives are not mutually exclusive—a toll implemented to raise revenue to fund infrastructure improvements will also send a price signal to the users of that road or bridge facility, which will impact demand. The design of the tolling system, however, and the way the toll rate is set will likely differ based on the primary objective(s) of the tolling project.

- If the main goal is to **raise revenue**, tolls are usually a **flat rate** or determined based on the infrastructure **impact of a vehicle** (e.g. tolls on the Bridge of the Gods and the Tacoma Narrows Bridge escalate for heavier, multi-axle vehicles, which cause more wear and tear on the road).
- If the main goal is to **manage demand**, toll rates are usually set in order to achieve a desired level of throughput and flow. The system may be designed to be **dynamic based on conditions**—in other words, the rate could be higher or lower at certain times of day, or rates could be higher when congestion is worse and lower, or even free, when congestion is at its lowest. When tolls are used to change travel demand, it is often referred to as "congestion pricing" or "value pricing."

Although tolling is not used widely in Oregon, tolling is used effectively in many other cities to both raise revenues and manage demand (see more information on case studies later in this memo). That said, tolling for demand management on a fully unmanaged, existing roadway has not yet been implemented in the United State (though this is now permissible through the federal Value Pricing Pilot Program, following approval from the USDOT Secretary of Transportation. Oregon would be applying for this approval to apply tolls on I-5).

Despite its proven effectiveness as a demand management tool, political acceptance can be challenging to obtain, particularly when the public is unfamiliar with paying tolls.[6] The way tolling systems are implemented and how tolling revenue gets used also can have significant equity implications.

Equitable Mobility Considerations

As with all pricing typologies, the design, implementation, outcomes, and revenue reinvestment of any tolling project can influence equitable mobility of a transportation system:

Outcome Considerations

- *Vehicle miles traveled (VMT) reduction:* By raising prices and requiring people to pay more for particular trips, tolling can encourage a shift away from driving alone to carpooling, using transit or other alternatives. It can also prompt people to avoid some trips and/or bundle trips into one.[7] All of these actions can help **reduce VMT**, which has knock-on benefits for the **efficiency of the system**, **air quality, climate,** and **safety**.
- *Reliability and connectivity improvements:* Tolling sends a price signal to users of a facility, which can regulate demand for that roadway (i.e. people will only use the facility if paying the toll is worth it to them). This manages congestion and can help maintain more free-flowing conditions, particularly in peak congested times. Improving the efficiency of a roadway and reducing travel times can make it easier for people to access more jobs and services. Tolls can also help make travel times more consistent and **reliable**, helping drivers and transit riders alike plan their journey. If tolled facilities are faster than non-tolled facilities, people have the option to utilize that faster route if they are willing and able to pay the toll. While this can increase **connectivity**, it also can overly burden those who cannot **afford** to pay the toll, forcing them to spend more on transportation or choose a less efficient route.
- *Reduced need for roadway expansion:* Effectively managing demand for existing facilities can **reduce the need to increase capacity** and expand roadways.[8] This can preserve land uses, avoid demolition in communities neighboring roadway facilities, and save public dollars. Roadway expansion also typically brings additional air quality, climate and safety impacts.
- *Diversion risks:* People who choose not to drive on tolled facilities may shift their trips onto other side streets as they seek an alternative route.[9] This effect is called "**diversion**." While diversion can improve the efficiency and conditions of the tolled facility itself, it has the potential to increase traffic on calmer streets, potentially affecting **safety, air quality, and efficiency** of those roads. In many areas, neighborhoods near highways have higher concentration of Black, indigenous, and people of color (BIPOC) and lower-income individuals, so diversion from major thoroughfares may disproportionately impact these communities. Diversion also occurs when unmanaged roadways become congested, particularly now that GPS mapping technologies can quickly direct drivers to the most efficient routes. So diversion risks of tolling must be compared with diversion risks of not managing demand and letting congestion continue to increase. Different design parameters can help mitigate diversion effects, however, as will be discussed in the next section.

Design and Implementation Considerations

- *Flat versus dynamic pricing systems:* As with most pricing strategies, toll fees can either be ***flat***—the same charge is applied to everyone at all times of the day, regardless of conditions—or ***dynamic***—the charge varies based on time of day, conditions, or user characteristics (e.g. income, fuel type, occupancy, etc.). While flat fees may be considered "fairer" since everyone pays the same and they are easier to administer, they are **regressive**, meaning they disproportionately burden lower-income individuals. Dynamic fee designs are considered more equitable because they **provide more options** and alternatives for those with different means. The degree of variability designed into a dynamic system impacts how equitable it might be (see Figure 2).
- *Affordability of toll rates:* Whether a flat or dynamic system, the price of the toll is a significant factor when considering impacts on **affordability** and equity. Implementors need to evaluate the relative impact and burden of the toll fee on household transportation costs for impacted individuals. In dynamic systems, the fee is often set to achieve the desired conditions on the road. In some regions that have these systems, that means the toll rates can rise very high if

that's what is needed to influence demand among high-income drivers (for example in Virginia, rates have been higher than $40 for some tolled facilities).[10] To avoid this, some cities set caps on how high the toll rate can rise (for example, the tolls on SR-520 in Seattle max out at $10). While this can protect drivers from paying extremely high fees, it also may limit how effectively the toll can manage demand if the maximum rate isn't a strong enough price signal for most drivers.

- *Discounts, rebates and exemptions:* Toll systems can also be designed to provide discounts, rebates or exemptions to **mitigate the cost burden** on lower-income individuals or to incentivize certain types of trips. "**Discount**" generally refers to providing a reduced fare at the time of payment. "**Rebate**" refers to providing cost recovery for certain users (e.g. a check is mailed back to someone to refund tolls paid). "**Exemptions**" refers to groups not being charged a toll at all due to certain characteristics. Examples of how these strategies can be applied include:
    - *Income-based:* Toll rates or systems are designed around income bands to mitigate regressive impacts on lower-income individuals.
    - *Occupancy-based:* Toll rates or systems are designed to encourage multi-passenger trips (e.g. carpools).
    - *Vehicle-based:* Toll rates or systems are designed to encourage alternative fuel types (e.g. electric vehicles or hybrids).
    - *Mode-based:* Toll rates or systems are designed to accommodate certain modes (e.g. transit, etc.) or charge more based on impact (e.g. heavy trucks).

While discounts, rebates and exemptions are tools that can be used to mitigate affordability impacts and make a pricing system more equitable, they can also impact the effectiveness of the demand management strategy. The more drivers that are exempt from paying a toll, the less effective that toll will be at sending a price signal and influencing trip behavior and choice. They also can create political conversations about who deserves a discount/exemption and why. That said, they are an important design consideration in creating a tolling system that delivers the outcomes desired—including equity, climate, safety and more.

Figure 2: TransForm Pricing Strategy Equity Matrix

TransForm's report, "*Pricing Roads, Advancing Equity*," introduces a matrix for understanding the impact of how pricing strategies are designed and equity implications. The table below summarizes how the more dynamic and means-based a system is, the less regressive its outcomes will be.

While the TransForm matrix considers flat-rate pricing the most regressive of the pricing designs, the "status quo" also disproportionately burdens low-income drivers and those with the fewest options. The City's current hypothesis is that unmanaged, congested roads or unmanaged roadway expansion lead to the greatest inequities.

PRICING STRATEGY EQUITY MATRIX	
PRICING STRATEGY	***EQUITY IMPACTS***
24 hour **Flat-rate pricing**	Likely to be most regressive strategy, charging low-income drivers who often don't commute at peak commute hours. Least efficient at reducing congestion. Used on many tolled facilities.
Dynamic pricing varies with time or congestion	Efficient charging system but may be regressive (though likely less regressive than gas and sales taxes).
Dynamic pricing with some means-based discounts or rebates	Less regressive due to discounts.
Means-based pricing with targeted caps and/or exemptions	System designed specifically not to be regressive. Some loss of efficiency as plentiful discounts, caps and exemptions may limit the congestion and climate benefits.

- *Considering displacement and available alternatives:* Where tolls are located can also have a significant impact on equity. In cities like Portland where displacement and gentrification have pushed BIPOC communities and lower-income individuals further away from the central city, the **availability** of non-vehicular transportation options may be limited. If a facility is tolled and there are no good alternatives available (e.g. other routes to drive, reliable and efficient transit, **job centers accessible** without using the tolled facility), this can have a disproportionate burden on displaced community members who still have to travel in to the city core for work. On the other hand, tolling can make congested highways and other facilities more **efficient and reliable**, which can benefit people who have to make longer commutes using those roadways.

Revenue Reinvestment and Complementary Strategy Considerations

- *Investing in complementary strategies:* Toll systems often identify priorities for revenue reinvestment up front.[11] For tolling systems where the primary goal is to recoup costs from infrastructure construction, the toll revenue is usually earmarked entirely to cover administrative costs of the system and then to pay off the construction value. Often these tolls are removed once the costs are fully recouped. Tolling systems designed for demand management, on the other hand, may generate an ongoing stream of revenue. While toll revenue is usually used to cover the administrative costs of the tolling program, agencies can also reinvest toll revenue to mitigate impacts of the tolled facility and advance other equitable mobility goals. For example, revenue could be reinvested in supporting other modes (e.g.

transit, biking, and walking); supporting discounts, rebates and exemptions; supporting infrastructure and programs that encourage low- and zero-emission vehicles (e.g. EV charging); and more. Figure 3 summarizes the potential equity implications of various reinvestment strategies.

- *Revenue restrictions:* While revenue can hypothetically be invested in myriad complementary strategies, in Oregon, constitutional restrictions require:

  > *"[…] use of revenue from taxes on motor vehicle use and fuel […] shall be used exclusively* ***for the construction, reconstruction, improvement, repair, maintenance, operation and use of public highways, roads, streets and roadside rest areas in this state****" (Article IX Section 3a).*[12]

  There are differences in interpretation around whether a roadway toll constitutes a tax on motor vehicles and fuels, and therefore whether tolls would be subject to this restriction. If they are, this would mean it is currently not feasible to reinvest toll revenue into expanded transit service, for example, but it can be used for improvements that benefit transit or other modes within the right-of-way (e.g. transit-priority lanes, transit stops, etc.).

Figure 3: TransForm Revenue Reinvestment Equity Matrix

TransForm's "*Pricing Roads, Advancing Equity*" report also introduces the following matrix for understanding the impact of different reinvestment strategies. The more reinvestments are focused on improving alternative options with an intensive focus on vulnerable communities, the greater equity impact they will have. For all investments, potential property value, gentrification and displacement risks must also be considered, as well as whether these investments in new mobility options will meet the needs of BIPOC and low-income community members.

REVENUE INVESTMENT EQUITY MATRIX	
INVESTMENT STRATEGY	***EQUITY IMPACTS***
Road expansion	Does not add more affordable options.
Mix of road expansion and transit	Some drivers can shift to new, more affordable modes. Transit users also benefit.
Transit, walking, and bike infrastructure with targeted carpool, vanpool, and new mobility options where needed	Allows greater shift to more affordable and sustainable modes.
Transit, walking, and bike infrastructure with an **intensive focus on vulnerable communities**	Significant expansion of commute options and a reduction in user costs (if fares are reduced on transit and other mobility options).

Tolling Strategies

Tolling systems can be designed in a myriad of ways using a variety of different technologies to suit a particular context. Several terms are used to describe toll facilities, which are summarized in Figure 4. For our purposes, we will consider tolling strategies in two broad categories: tolled lanes and tolled facilities.

Figure 4: Glossary of Key Terms	
Toll	*A direct user fee charged to a vehicle for using a roadway facility, such as a highway, bridge or tunnel.*
Value pricing	*Another term for tolling to manage demand and congestion*
Flat rate	*The rate stays the same for all users and does not vary based on time of day or other conditions*
Dynamic rate	*The rate varies based on different factors, including time of day, conditions of congestion, and user characteristics*
Discount	*Providing a reduced fare at the time of payment*
Rebate	*Providing cost recovery for certain users after tolls are paid*
Exemption	*Certain groups are not charged a toll due to their characteristics*
Toll lane	*Tolling system where a fee is only charged on designated lane(s) on a facility*
HOT lane	*"High-occupancy toll" lane; refers to a tolled lane where multi-passenger vehicles drive free, but single-occupancy vehicles can pay to drive*
Express Toll Lane	*Tolled lane where all users are charged a toll, including high-occupancy vehicles*
Toll facility	*Tolling system where all lanes on a roadway are priced (e.g. all lanes on a stretch of highway or bridge)*
Open-road tolling	*Modern tolling systems that allow traffic to pass more freely and collect tolls electronically without physical toll booths or plazas (e.g. E-ZPass, FasTrak)*
License plate identification	*A tolling technology that uses cameras or videos on the roadway take a picture of license plates to identify vehicles and administer tolls.*
Transponder	*A radio-frequency identification chip installed in one's vehicle, usually with a sticker or a small unit affixed to the windshield, used to collect tolls electronically as part of open-road tolling.*
Gantry	*A bridge-like overhead structure on which tolling technology can be affixed to monitor, enforce and charge tolls without toll booths.*
Leakage	*Refers to vehicles that should be charged a toll but are missed by the toll recognition technology, resulting in lost revenue.*

Tolled Lanes

On facilities with tolled lanes, only one or a few of the lanes are priced, while the rest of the lanes are left unpriced. This provides an option for travelers to pay to travel in the tolled express lane(s) or to not pay and use the other non-tolled lanes on the facility. For tolled lanes to be feasible, a facility usually needs at least three through lanes (so one can be priced while at least two remain unpriced). During the feasibility analysis phase of ODOT's I-5 and I-205 tolling project, it was concluded that tolled lanes are not a viable demand management strategy in the Portland Metro area because there are only two through lanes in many sections.

High-occupancy toll lanes, or HOT lanes, allow multi-passenger "high-occupancy" vehicles (HOV) to use a lane for free, while single-occupancy vehicle (SOV) drivers can pay to use the lane as well. HOT lanes generally feature dynamic tolls so the lane can remain free-flowing.[13] There are more than 20 HOT lanes operating in a dozen states nationwide, including the cities of Seattle (SR 167 HOT Lane), San Francisco (Bay Area Express Lanes), and San Diego (I-15) with more poised to open.[14] In the San Diego I-15 example, funding generated is spent on express bus service using the lane. Unpriced HOV lanes have been converted into HOT lanes in some cities to improve vehicle flow on congested corridors.[15]

Express Toll Lanes (ETLs) are dedicated managed lanes that also charge variable tolls while other lanes remain unpriced. However, unlike HOT lanes, ETLs charge all vehicles rather than making multi-

passenger trips exempt. Enforcement is much simpler and less costly in ETLs than HOT lanes because there is no need to enforce vehicle occupancy.[16]

Evidence around the efficacy of priced lanes to manage demand and the impact on equitable mobility is mixed. Opponents have referred to priced lanes as "Lexus Lanes" because they disproportionately benefit drivers with higher incomes who can choose to the pay the toll.[17] Research indicates in some places, however, that having the express option benefits lower-income commuters for whom trip reliability and arriving on time may be very important.[18] In terms of impact on VMT, congestion, mode shift, and emissions, results also vary. In some cases, evidence suggests priced lanes can spur VMT and emission reductions, while other case studies show express or HOT lanes worsening congestion in unpriced lanes or increasing VMT if they are tied to overall capacity increases.[19] [20] [21] [22]

Tolled Facilities

On tolled facilities, all lanes are priced, rather than just one or two lanes. Tolls are generally collected when a vehicle enters a tolled facility, though the toll rates may change along the facility in more congested areas as well (e.g. on a highway, a driver may pass through multiple toll zones and be charged a different rate based on their point-to-point entry and exit on the facility).

Tolling all lanes of a facility may be more effective at managing demand overall because the price signal is applied to all users, not those who opt into using the tolled lane. In Seattle, a study reported an initial 15% reduction in VMT on SR-520 when tolls were introduced, though there are limited examples in the United States to date of a free facility being converted into a fully tolled facility.[23] Furthermore, rates on tolled facilities are often lower than HOT lane rates because the price signal is applied to all users.

Available Tolling Technologies

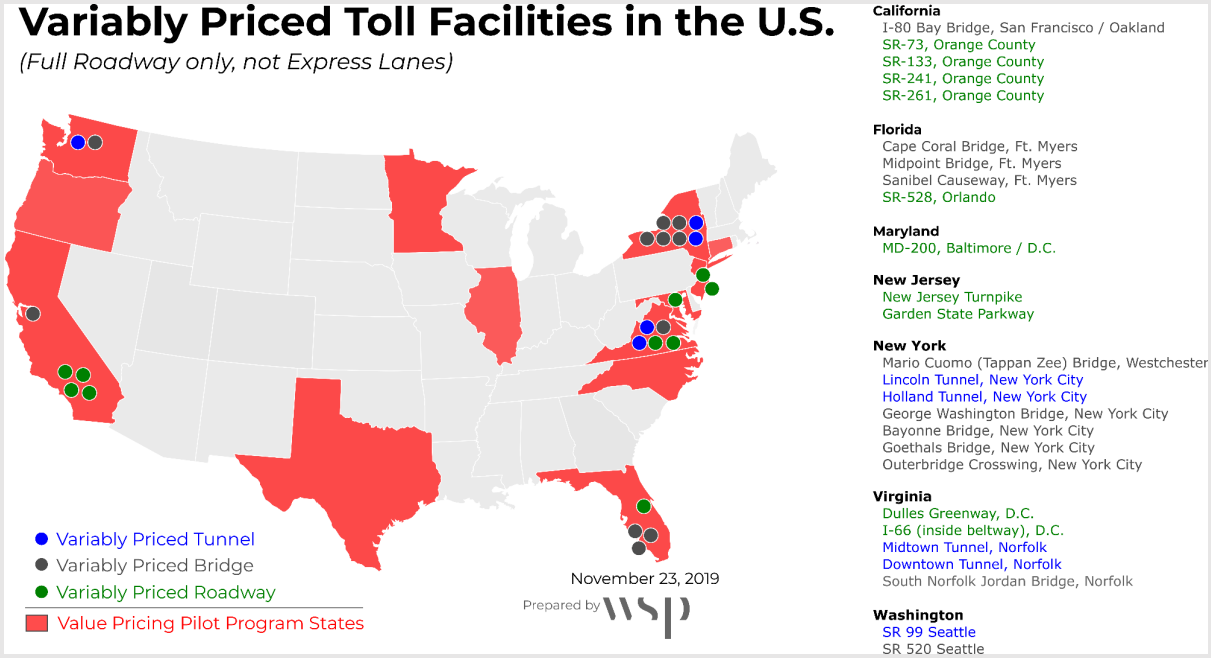
Traditionally, tolls were collected by stopping at a toll booth and paying a toll operator. Modern tolling technology enables traffic to pass more freely and collect tolls electronically without physical toll booths or plazas, although toll booths are still used in some places as an option for drivers whose vehicles are not equipped for electronic tolling or on lower-traffic facilities (like the Bridge of the Gods). These modern tolled facilities are often called "open-road tolling" (ORT).[24] ORT can be achieved using a variety of different tolling technologies, which help recognize vehicle types and bill accounts[25]:

- *License-plate identification:* Cameras or videos on the roadway take a picture of license plates, and software is used to check the plate against a database to find the owner associated with the vehicle. A bill for the toll is then sent to the person or company to whom the car is registered. The license plate database can also be used to apply exemptions, if the toll system is designed that way. This technology can also be used to monitor conditions on the roadway (e.g. how long it takes vehicles to travel from one point to another) and support dynamic tolling systems.
- *Transponders:* Transponders or "tags" involve installing radio-frequency identification chips in one's vehicle, usually with a sticker or a small unit affixed to the windshield. The transponder interacts with radio signals as the vehicle passes under a gantry over the roadway. This can instantly charge an account linked to that transponder, allowing drivers in some systems to prepay or pre-apply for exemptions if eligible. If a transponder is not detected, usually license plate cameras are utilized to follow up with a bill.
- *Future technologies:* Some cities are exploring additional ways to collect tolls, including using cell phones and GPS, satellite-based tracking systems. Jurisdictions exploring VMT-based charges—like the OReGO pilot program—are also exploring technologies that would enable per-mile charging, which could be coordinated with toll facilities if implemented.

Across these different technologies, the following issues must be considered[26]:

- *Privacy*: Recognition technologies and camera-based systems have raised concerns around personal privacy and data tracking. There are many methods for protecting privacy utilized by agencies that have electronic tolling systems.
- *Cost of implementation:* Setting up new tolling technology can be a significant resource outlay for an agency, but the revenue generated from a tolling system can be used to cover these administrative costs.
- *Enforcement and leakage:* While ORT systems help avoid delays on the system for toll collection, they also are not 100% effective, meaning if the technology does not work (e.g. a license plate image is blurry or something obscures a transponder), a toll may not be collected. Enforcing any exemptions or discounts also requires further enforcement (e.g. using technology to assess how many people are in a vehicle), which can lead to inaccuracies. The term "leakage" is used to refer to revenue not collected because of these enforcement issues that should have been charged. There are also concerns about penalties and enforcement impacts for people who do not pay.
- *Accessibility and means testing:* New tolling technologies may pose accessibility concerns for unbanked community members. And while technological platforms can help facilitate discounts, rebates and exemptions, they also may add a burden on lower-income individuals to self-report means testing information. Technology can potentially be used, however, to tap into existing means-testing programs to reduce this burden.

Case Studies



Seattle – SR 520

- **Goals**: Raise revenue to fund bridge replacement; manage congestion in the corridor
- **Rates**: Tolls vary by time of day; currently range from $1.25 to $4.65
- **Exemptions:** Buses, vanpools and emergency vehicles are exempt
- **Results** (*from 2014 study, more information: https://rosap.ntl.bts.gov/view/dot/12127*):
    - Change in VMT and volumes –
        - Initial 15% drop in VMT
        - Initial 50% drop in traffic volumes, later rebounding to only a 30% drop
        - 28% drop in trips of lowest-income users, compared to 19% overall (bigger change in trips among lower-income users)
    - Mode shift –
        - 8% of SR 520 drivers had switched to transit on same route
        - No reported increase in regular carpooling
    - Diversion problematic - 25% of daily commuters changed their primary route to a free, parallel highway

Maryland – Intercounty Connector (ICC)/MD 200 toll road

- **Goals**: Manage congestion and provide motorists with reliable travel times; fund construction of the ICC
- **Rates**: Tolls vary by time of day, distance traveled and vehicle size (2-axle to 6+ axle), range from $0.07 to $1.88 per mile
- **Exemptions/discounts**: Rebate/discount provided for using certain turnaround exits; ICC provides express routes for transit
- **Results** (*from https://mdta.maryland.gov/sites/default/files/Files/MDTA%20ICC%20Brochure.pdf):*
    - Significant time savings compared to local roads (up to 70%)
    - Estimated to have prevented 350 crashes by improving traffic flow and reducing congestion
    - Benefits transit by providing express route

Endnotes

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[4] The full City of Portland letter to the OTC can be viewed here: https://www.portlandoregon.gov/transportation/article/759365
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[11] Cambridge Systematics (2017).
[12] Quirke, R. (2018) "Fuel Tax Allocation and the Oregon Constitution." https://www.policyinteractive.org/fuel-tax-allocation-and-the-oregon-constitution/
[13] I-10 in Los Angeles, have activated HOV-only restrictions, prohibiting SOV use when speeds in the HOT lane fall below 45 miles per hour.6
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