THE INNOVATIVE DOT

Focus Area 3: Pricing

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Appropriate pricing strategies can raise revenues and manage demand, keeping costs down. On the other hand, when transportation system users do not see appropriate price signals, demand is artificially high, increasing congestion and pressure for new capacity. State departments of transportation generally cannot impose price signals on their own, but they can work with a variety of stakeholders and decision-makers, from legislators to insurance companies, to accomplish these goals.

In this section:

- Use Variable Tolling to Manage Demand
- Implement Pay-As-You-Drive Insurance

Pictured: Express Lanes along Utah's I-15. *See "Use Variable Tolling to Manage Demand" to learn more.*

Use Variable Tolling to Manage Demand

The Opportunity

It is well known that transportation funding in the U.S. has not kept pace with the cost of system maintenance and modernization. Tolling can help solve this problem by creating a user-generated revenue source for transportation. Just as important, tolls can help to manage finite roadway capacity, moderating demand through the use of pricing based on location, time of day, and traffic conditions. Variable tolls that are higher at peak times can reduce traffic congestion by shifting transportation away from single-occupancy vehicles, out of peak travel periods, and to less-congested roads or modes of transportation. Tolling can also be a more popular alternative to fuel tax increases, especially if the revenues are earmarked for maintaining transportation infrastructure and the toll variability can be shown to reduce congestion.

State and local governments, travelers, and businesses can all benefit from demand-sensitive tolling. Transportation agencies receive additional dollars without having to borrow or implement a tax increase. For drivers, traffic in tolled lanes can be priced to move at a faster pace than non-tolled lanes, saving time on commutes and guaranteeing reliable speeds and travel times. Express bus riders experience a similar speed and travel time benefit, because express buses are typically given free access to managed lanes. Variable tolling also sends a price signal that leads some drivers to use public transportation, carpool, or shift trips to off-peak hours. In fact, using tolls for demand management may be cheaper than building new roadway capacity. According to estimates by the Federal Highway Administration (FHWA), widespread use of value pricing methods such as variable tolling would reduce the amount of capital investment needed to sustain the performance and condition of the highway system by nearly one-third—from $127 billion per year to about $85 billion per year.[1]

Unsurprisingly, variable tolling raises fairness and equity considerations related to the distribution of the benefits and burdens of the toll. Broadly, there are three types of equity concerns for tolling projects: income equity (does the project negatively impact low-income people?), geographic equity (does the project negatively impact particular areas?), and modal equity (does the project negatively impact people who are taking transit?). These concerns have derailed tolling projects in many states and cities, and the extent of variable tolling's equity impact is still being examined.[2] Nevertheless, attempts can be made to address fairness concerns through the design of the tolling program, for instance, by putting toll revenues back into the tolled corridor to finance transit service as well as the highway.

What Is It?

Flat-price tolls have long been employed to cover the costs of construction and sometimes operations and maintenance of highways. Variable tolling, the modern version of this long-standing practice, also raises revenues, but at the same time manages demand to reduce congestion and the need for costly expansions. Variable tolling is a type of value pricing where prices are set to align with the value delivered from quicker and more reliable travel times. Variable tolling has the added benefit of generating revenue to cover some portion of the costs of providing the service.

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1 Congressional Budget Office. (2011, May 17). "The Highway Trust Fund and Paying for Highways," p. 14. Retrieved 5/8/12 from http://www.cbo.gov/sites/default/files/cbofiles/ftpdocs/121xx/doc12173/05-17-highwayfunding.pdf.

2 Government Accountability Office. (2012, January). "Road Pricing Can Help Reduce Congestion, But Equity Concerns May Grow." (GAO-12-119). Retrieved 9/12/2013 from http://www.gao.gov/assets/590/587833.pdf.

Value pricing is widely used to manage demand for other classes of infrastructure such as water and power, where prices may be higher during on-peak periods or as usage increases. In transportation, value pricing means charging drivers an extra fee to use an express lane or to drive on a particular roadway; this fee will be higher when the road or lane is more congested.[3] Faced with paying a fee that is higher at peak times, fewer drivers will use the highway or express lane at that time, so traffic is reduced and trip times for those willing to pay the toll become shorter and more reliable.

Variable tolling optimizes the use of roadways when they are close to or at full capacity. It offers many benefits, including reduced congestion, shorter travel times, more reliable travel times, and more efficient investment in roadway infrastructure.

Currently operational tolling projects include four types of pricing strategies to manage demand:[4]

1. High occupancy toll (HOT) lanes: variably priced lanes that set pricing based on time of day, level of congestion, or a pre-set schedule;
2. Variable tolls on entire roadways: peak period-priced facilities that base pricing on time of day;
3. Cordon charges: variable or fixed charges to drive within or into a congested area; and
4. Area-wide charges: per-mile charges on all roads within an area that may vary depending on congestion.

The latter two—cordon charges and area-wide charges—are not yet common in the United States, but HOT lanes and peak-period priced facilities have been gaining momentum since the 1990s.

Implementation

Variable tolling in the form of variably priced lanes and roads and peak-period priced facilities is underway on roadways in a number of states, including California, Texas, Florida, Georgia, New Jersey, Minnesota, Washington, Utah, Colorado, Maryland, and Virginia (see Figure 1 below). Projects are being considered and/or developed in North Carolina, Illinois, and Oregon.

The path to authorizing and implementing variable tolling has been unique in each state. In Minnesota, it took more than a decade of failed bills and investigative studies before the Minnesota State Legislature passed a bill authorizing the state to implement variable tolls.[5] In Oregon, on the other hand, the authority to impose variable tolls for the purposes of a pilot project passed the Legislature relatively smoothly.[6] Meanwhile, the FHWA's Congestion Pricing Pilot Program, which was established in 1991, hastened the legislative process by funding variable tolling projects in San Diego, Houston, and Lee County, Florida. Not surprisingly, these states were among the first to authorize variable tolling.[7]

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3 Federal Highway Administration. (2001, October 17). "Value Pricing Pilot Program Information." Retrieved 9/12/2013 from http://www.fhwa.dot.gov/policy/vppp.htm.

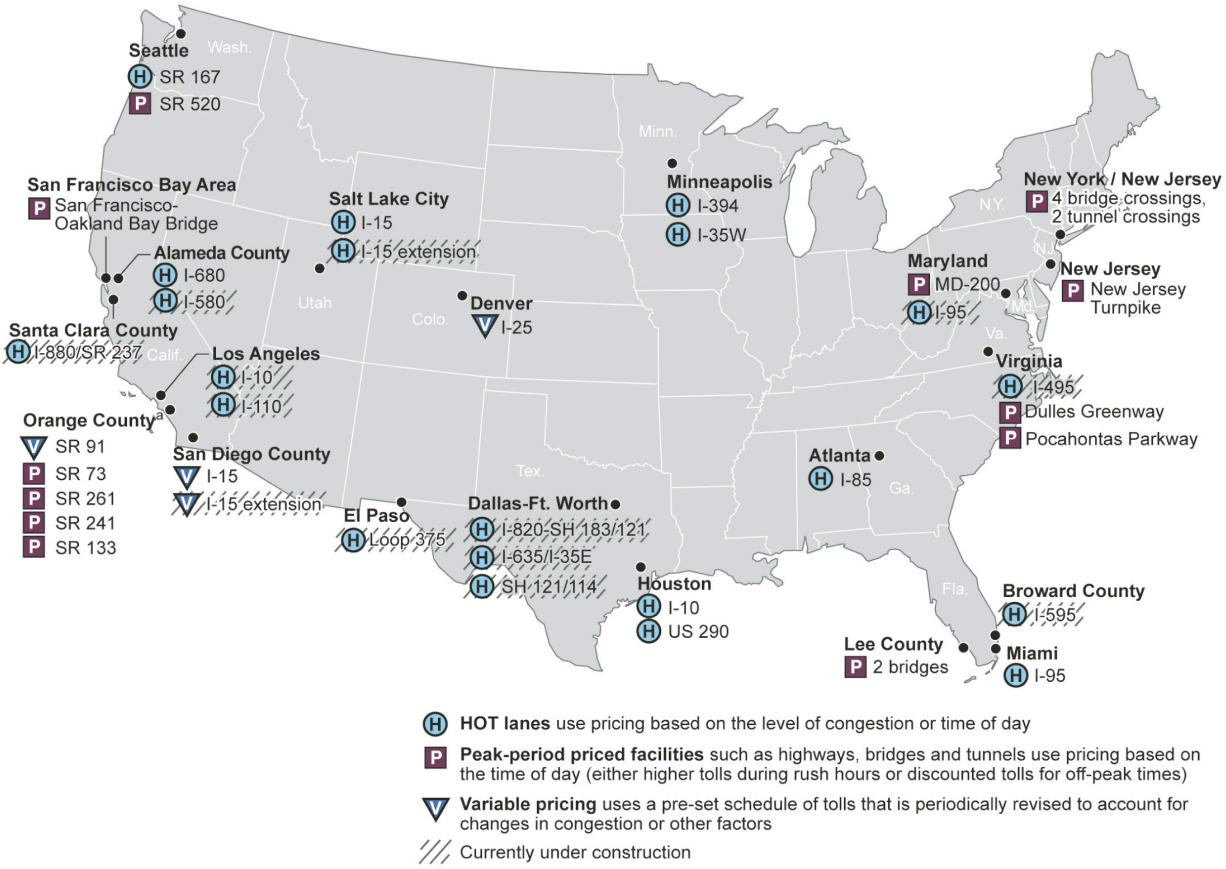
4 Federal Highway Administration. (2008, May 30). "Congestion Pricing: A Primer, II. What is Congestion Pricing?" Retrieved 9/12/2013 from http://ops.fhwa.dot.gov/publications/congestionpricing/sec2.htm.

5 Government Accountability Office. (2012, January). Road Pricing Can Help Reduce Congestion, but Equity Concerns May Grow(GAO-12-119). Retrieved 9/12/2013 from http://www.gao.gov/assets/590/587833.pdf.

6 Buckeye, K., & Lee M. (2004). "Value Pricing Outreach and Education: Key Steps in Reaching High-Occupancy Toll Lane Consensus in Minnesota." University of Minnesota, Humphrey School of Public Affairs. Retrieved 9/12/2013 from http://www.hhh.umn.edu/centers/slp/transportation/congestion_pricing/pdf/ValuePricingOutreachandEducation-Buckeye_Munnich.pdf.

7 Oregon Department of Transportation. (2010, November 30). *Congestion Pricing Pilot Program Report*. Retrieved 9/12/2013 from http://www.oregon.gov/ODOT/HWY/REGION1/congestionpricing/113010_CongestionPricing.pdf?ga=t.

Figure 1
U.S. Congestion Pricing Projects in Operation or Under Construction[8]



Variable tolling can be introduced in several ways, including pricing existing high occupancy vehicle (HOV) lanes, where excess HOV capacity is "sold"; applying value pricing (varying by time of day, level of congestion, vehicle classification, etc.) on tollways that currently rely on static tolling; and pricing new capacity on freeways or in particular regions within a city.

If variable tolling is not yet in place in a particular state, the following steps would typically accompany implementation:

1. **Determine the limitations of the state tolling authority/commission.**[9] State enabling legislation may be needed to implement variable tolling and/or require tolling authorities to obtain voter approval prior to implementation. Legislation should be aligned with a particular state's goals for variable tolling. In Washington, for example, the authorizing legislation allows the tolling authority to offer discounts to single-occupancy vehicles with low emissions.[10] Such exceptions can increase the project's popularity, but the more exceptions to the fee, the less likely the facility will produce the desired level of revenue.

8 Government Accountability Office. (2012, January). "Road Pricing Can Help Reduce Congestion, but Equity Concerns May Grow." (GAO-12-119). Retrieved from http://www.gao.gov/assets/590/587833.pdf.

9 The federal government imposes restrictions on tolling of interstate highways. The new MAP-21 federal transportation act provides some new freedoms but, at this writing, the U.S. DOT has not issued related guidance.

10 Texas Transportation Institute. (2011, March). "Operational Performance Management of Priced Facilities." Retrieved from http://tti.tamu.edu/documents/0-6396-1.pdf.

2. **Conduct analysis and feasibility studies.** Concurrent with legislative action to authorize variable tolling, extensive legal, environmental, technological, organizational, pricing, traffic, demand, and financial analysis will be necessary to set the range, structure, and management of the tolls and tolling facilities, and to gauge the impact of variable toll introduction on existing traffic patterns. An example of such a study was carried out for the City of Seattle, which is in the process of implementing variable tolling on several roads and bridges.[11]

3. **Engage and educate the public.** Public resistance to and a lack of understanding of the benefits of value pricing are likely the most challenging obstacles to implementation. Where the toll is new, many drivers will resist the concept just because it introduces a fee on something that was previously free. Where flat tolls are converted to variable charges, drivers may suspect a scheme to simply raise rates. Plain and direct communication on the benefits of tolling—including time-savings for travelers and revenues to invest in travel alternatives—are essential to the success of a tolling project. When variable tolling started in Lee County, Florida, the slogan "Avoid the rush, pay half as much!" was advertised to promote taking trips off-peak.[12] Extensive communication regarding the phase-in schedule for tolling, the toll structure, and the application of revenues and transit alternatives is also crucial.

   In addition to public engagement in the logistics and benefits of variable tolling, equity concerns associated with tolling must be addressed. As noted previously, one roadblock to variable tolling programs is actual or perceived inequity to disadvantaged communities, where higher tolls prevent low-income people from using certain roads and the benefits of express lanes are only available to those able and willing to pay the toll. Studies on this topic show that correctly identifying equity concerns and addressing them with careful planning can alleviate many of the problems, though the scope and depth of the equity impact is still being studied.[13] Key issues include whether toll facilities are located in the areas of highest need, whether there are ways to redistribute toll revenue to disadvantaged communities, whether a viable public transportation alternative exists or can be created in the corridor, whether alternative access options such as free use by HOVs or discounted toll rates for low-income households have been considered, and whether citizen groups were involved in identifying projects and considering the impact on their communities.

4. **Report on performance.** Success begets success, but success must be demonstrated and highlighted. Determine which performance measures—travel time savings, freight movement, reliability, traffic reduction, emissions reduction, or reinvestment—will be most compelling to elected officials and the public so to demonstrate. Even in the early assessment stages, it is vital to understand how the public and elected officials measure success and what is most meaningful to them. Measuring and reporting outcomes and successes will build a case that will allow tolling projects to be replicated elsewhere in the state.

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11 Booz Allen Hamilton, Booz & Company, and the City of Seattle Department of Transportation. (2009, May). Seattle Variable Tolling Study. Retrieved from http://www.seattle.gov/transportation/docs/FINAL%20Tolling%20Study%20report%20revised%206.25.10.pdf.

12 Center for Urban Transportation Research. (1998). "Variable tolling starts in Lee County, Florida." http://cutr.usf.edu/pubs/news_let/articles/winterC98/news936.htm.

13 Congressional Budget Office. (2009, March). "Using Pricing to Reduce Traffic Congestion." Retrieved from http://www.cbo.gov/sites/default/files/cbofiles/ftpdocs/97xx/doc9750/03-11-congestionpricing.pdf.

Case Studies

California

In California, AB 1467, approved in 2006, allowed California's Regional Transportation Agencies, in cooperation with the state DOT (Caltrans), to apply to the California Transportation Commission (CTC) to develop and operate new variably priced HOT lanes.[14] The CTC has approved four new projects that meet its eligibility guidelines, two in Northern California and two in Southern California.

More recently, Senate Bill 4 (SBx2), like its predecessor, authorizes Caltrans and Regional Transportation Planning Agencies to nominate transportation projects for approval by CTC, with no limit on the number of projects to be approved.[15] Variable pricing projects must go through this process. Approved projects must satisfy four performance objectives:[16]

1. Improve mobility through faster travel times or reduced congestion;
2. Improve operation/safety;
3. Provide quantifiable air quality benefits; and
4. Address known forecast demand.

SBX2 4 also created the Public Infrastructure Advisory Commission, a clearinghouse for public-private partnership-related services and information. This legislation sunsets on January 1, 2017.

Two California variable pricing projects have served as models for states and DOTs for decades. The first, the SR-91 express lanes in Orange County, opened in 1995 as a private toll road venture between Caltrans and the California Private Transportation Corporation (CPTC), and has been variably priced, based on a pre-set schedule, since. This project predated AB 1467 and was authorized by the state's earlier public-private partnership legislation, AB 680, which allowed Caltrans to enter into agreements with private entities to develop, operate, and maintain transportation demonstration projects. Spurred by a controversial non-compete clause in the original agreement with the CPTC, the Orange County Transportation Authority bought the toll road from the private company in 2002 and continues to operate and maintain it today.[17] The peak express lane toll (3-4 p.m. eastbound on Fridays) was $10.05 as of July 1, 2012, making it the country's most expensive toll road (which is appropriate, given that it is also one of the most heavily used roads in the country).[18] Transit vehicles and carpools use the road toll-free, except when traveling eastbound during weekday evening rush hours, when they pay 50 percent of the full toll. Fifteen years of data demonstrate that the SR 91 express lanes have been a success: the average speed of vehicles in the express lanes is more than 60 miles per hour (mph),[19] reducing commute times by 20 to 30 minutes each way for express lane users.[20] Recent discussions have considered extending the express lanes into Riverside County and connecting with I-15.[21]

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14 California State Legislature. (2006). Assembly Bill No. 1467. Retrieved 8/20/12 from http://www.dot.ca.gov/hq/innovfinance/Public-Private Partnerships/ab_1467_bill_20060519_chaptered.pdf.

15 California State Legislature. (2009). Senate Bill 4 (SBx2). Retrieved from http://www.leginfo.ca.gov/pub/09-10/bill/sen/sb_0001-0050/sbx2_4_bill_20090220_chaptered.html.

16 California State Legislature. (2009, February 11). California Senate Bill X2 4. Retrieved from http://www.leginfo.ca.gov/pub/09-10/bill/sen/sb_0001-0050/sbx2_4_bill_20090220_chaptered.html.

17 California Department of Transportation. "State Route 91 (91 Express Lanes)." Retrieved 9/12/2013 from http://www.dot.ca.gov/hq/paffairs/about/toll/rt91.htm.

18 Orange County Transportation Authority. (2012, July 1). "Toll Schedules." Retrieved 9/12/2013 from http://www.91expresslanes.com/schedules.asp.

19 Federal Highway Administration. (2006, December 27). "Congestion Pricing: A Primer, IV. Examples in the U.S." Retrieved 9/12/2013 from http://ops.fhwa.dot.gov/publications/congestionpricing/sec4.htm.

20 Orange County Transportation Authority. (2011). *91 Express Lanes: Fiscal year 2010-2011 Annual Report*. Retrieved 9/12/2013 from http://www.octafiles.net/91annual.pdf.

21 Adams, C. (2011, December 19). "Local agencies pave the way for 91 Express Lane project." OC Metro. Retrieved

San Diego's I-15 express lanes, California's second variable pricing example, were converted from HOV lanes as part of the FHWA's Congestion Pricing Pilot Program in 1996. Prior to the implementation of the program, the I-15 corridor just north of San Diego was perennially congested, with average delays ranging from 30 to 45 minutes. Projections showed that, by 2020, those delays could increase up to an hour and a half if improvements were not made.[22] Operated by the San Diego Association of Governments (SANDAG), the original facility was an eight-mile, two-lane, reversible HOV facility. Since then, it has grown into a 20-mile stretch of express lanes between SR 78 in Escondido and SR 163 in San Diego.[23] The full corridor opened to drivers in January 2012, with tolls ranging from 50 cents to $8, depending on congestion and the distance traveled.[24] HOT lane users saved 20 minutes over unpriced lane travelers, by one estimate.[25]

Dubbed the "expressway-within-the-freeway," the project has a movable barrier that can allow for three lanes of traffic in the peak direction and direct access ramps for transit, carpools, vanpools, motorcycles, and permitted clean air vehicles—all of whom do not pay the toll—and solo drivers, who pay a toll via a transponder. Revenues from the corridor fund an express bus that currently operates only during peak commute hours but, by 2013, will be replaced with a new bus rapid transit system that will operate every ten minutes. Revenues will also be used to purchase buses for the new system.[26] The total project cost, including the transit improvements, is about $1.3 billion and was funded by the local TransNet sales tax and various state and federal funds.[27]

Washington

Washington's transportation commission, an independent, non-partisan panel of experts appointed by the Governor, is authorized to set tolls in the state. However, the commission is not in charge of all aspects of tolling: Washington State DOT owns the tolling facilities, the Washington State Patrol enforces the tolling, and the State Legislature is the only entity with the authority to impose tolls on a facility. According to RCW 47.56.850, toll revenues must be set at a level that will generate income sufficient to meet operating costs for the tolling facilities, debt service associated with the facilities, and other obligations of the tolling authority.[28] Revenues may also be used for operation and maintenance of roads, as well as the optimization of system performance. Specifically, the RCW states that "established toll rates may include variable pricing, and should be set to optimize system performance... Tolls may vary for type of vehicle, time of day, traffic conditions, or other factors designed to improve performance of the system."

Seattle's successful HOT lanes were introduced (on converted HOV lanes) on nine miles of State Route (SR) 167 in 2008. The project, authorized by RCW 47.56.403, is a four-year pilot project.[29] Toll rates

9/12/2013 from http://www.ocmetro.com/t-OCTA-RCTC-91-express-lane-project-12-19-2011.aspx.

22 San Diego Association of Governments. (2012, January). "I-15 Express Lanes Fact Sheet." Retrieved from http://www.sandag.org/uploads/publicationid/publicationid_6_1065.pdf.

23 *Ibid.*

24 Federal Highway Administration Office of Operations. (2011, June 1). "Value Pricing Pilot Program Projects Involving Tolls: Project—California: HOT Lanes on I-15 in San Diego." Retrieved 9/12/2013 from http://ops.fhwa.dot.gov/tolling_pricing/value_pricing/projects/involving_tolls/priced_lanes/hot_lanes/ca_hotlanes_i15sd.htm.

25 Government Accountability Office. (2012, January). "Road Pricing Can Help Reduce Congestion, But Equity Concerns May Grow." (GAO-12-119). Retrieved 9/12/2013 from http://www.gao.gov/assets/590/587833.pdf.

26 Hawkins, R. (2012, January 12). "Last leg of I-15 express lanes dedicated, opens Jan. 16." San Diego Union-Tribune. Retrieved 9/12/2013 from http://www.utsandiego.com/news/2012/jan/12/last-leg-i-15-express-lanes-dedicated-opens-jan-16/.

27 San Diego Association of Governments. (2012, January). "I-15 Express Lanes Fact Sheet." Retrieved 9/12/2013 from http://www.sandag.org/uploads/publicationid/publicationid_6_1065.pdf.

28 Washington State Legislature. RCW 47.56.850. Retrieved 9/12/2013 from http://apps.leg.wa.gov/rcw/default.aspx?cite=47.56.850.

29 Washington State Legislature. RCW 47.56.403. Retrieved 9/12/2013 from http://apps.leg.wa.gov/RCW/default.aspx?cite=47.56.403.

vary dynamically to ensure that the HOT lanes are free-flowing even when general-purpose lanes are congested. The HOT lanes preserve transit and carpool advantages (they travel toll-free, and reports indicate that travel times for carpools and transit have not increased since the introduction of the HOT lane), while allowing solo drivers the option to pay for a faster trip when they need it.[30] Rush hour speeds on SR 167 increased by as much as 19 percent after the implementation of the tolls.[31] Average tolls are between $0.75 and $1.00, with the maximum toll floating around $4.75. HOT lane volumes have increased each year, and revenue increased by 35 percent in 2011 over 2010, generating $750,000. Toll revenue began exceeding operational costs in April 2011.[32]

Minnesota

The Minnesota DOT is authorized to charge tolls on dynamic shoulder lanes and HOV lanes by Minnesota Statute 160.93.[33] The commissioner must consult with the Twin Cities Metropolitan Council (the region's metropolitan planning organization) before implementing user fees. Notably, the statute requires that half of all revenues from the tolls not used to repay the capital and operating costs of the system be directed toward transit improvements.

Minnesota has two express lane facilities currently in operation, both conversions from underused HOV lanes: I-394,[34] completed in 2005, and I-35W,[35] completed in late 2009. Additional express lanes are planned on I-35, I-94, and Highway 36.[36] On existing segments of I-394 and I-35W, transit vehicles and carpoolers are allowed to use the lanes without charge, while single-occupancy vehicles are allowed to use the lanes by paying a toll that varies depending on traffic volume—the toll dynamically increases when traffic is moving below 50 mph. On I-394, solo drivers pay a toll of $0.25 to $8 during rush hours to use an 11-mile HOT lane. Tolls on I-35W depend on the section of the road, but the average toll during peak periods is $1 to $4, with a maximum of $8.[37]

Evaluations suggest that Minnesota's HOT lanes have reduced congestion and increased use of the formerly nearly empty HOV lanes. On a typical day, the HOT lanes move 1,000 vehicles each morning and 600 vehicles each evening out of general purpose lanes and into the express lanes. As a result, HOT lane users can expect a 20-mph increase in their average speed. Those in the general purpose lanes also see a slight increase in speed, thanks to the broader distribution of cars among lanes.[38]

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30 Washington State Department of Transportation. (2011). *SR 167 HOT Lanes Pilot Project: Third Annual Performance Summary May 2008 – April 2011*. Retrieved 8/20/12 from http://www.wsdot.wa.gov/NR/rdonlyres/C198671E-7B2F-4186-9912-A41A0B274103/0/SR167_AnnualPerformanceSummary_113011_FINAL_WEB.pdf.

31 Government Accountability Office. (2012, January). "Road Pricing Can Help Reduce Congestion, But Equity Concerns May Grow." (GAO-12-119). Retrieved 9/12/2013 from http://www.gao.gov/assets/590/587833.pdf.

32 Washington State Department of Transportation. (2011). *SR 167 HOT Lanes Pilot Project: Third Annual Performance Summary May 2008—April 2011*. Retrieved 9/12/2013 from http://www.wsdot.wa.gov/NR/rdonlyres/C198671E-7B2F-4186-9912-A41A0B274103/0/SR167_AnnualPerformanceSummary_113011_FINAL_WEB.pdf.

33 Minnesota Office of the Revisor of Statures. (2011). Minnesota Statute 160.93. Retrieved 9/12/2013 from https://www.revisor.mn.gov/statutes/?id=160.93.

34 Minnesota Department of Transportation & University of Minnesota, Humphrey Institute of Public Affairs. *I-394 MnPAss: A New Choice for Commuters*. Retrieved 8/21/12 from http://www.mnpass.org/pdfs/mnpassreport-uofm0306.pdf.

35 Federal Highway Administration. (2010, August 23). "I-35W MnPASS" – I-35W, Minneapolis, MN, HOV to HOT Conversion and Shoulder to HOT Conversion Project." Retrieved 9/12/2013 from http://ops.fhwa.dot.gov/freewaymgmt/publications/documents/nrpc0610/workshop_materials/case_studies/minneapolis_i35.pdf.

36 Minnesota Department of Transportation. (2012, October). MnPass Express Lanes. Retrieved 11/25/13 from http://www.dot.state.mn.us/metro/projects/35estpaul/pdf/mnpassfactsheet.pdf.

37 Minnesota Department of Transportation. MnPASS Express Lanes. Retrieved 9/12/2013 from http://www.mnpass.org/index%20394.html.

38 Minnesota Department of Transportation & University of Minnesota, Humphrey Institute of Public Affairs. *I-394 MnPAss: A New Choice for Commuters*. Retrieved 8/21/12 from http://www.mnpass.org/pdfs/mnpassreport-uofm0306.pdf.

Money collected from variable tolling on I-394 and I-35W must be deposited in a corridor-specific account within the state's special revenue fund. Money in the account is appropriated to the commissioner, who is required to repay the trunk highway fund and any other fund source for installing equipment or modifying the corridor for tolling. After paying all the costs of administering the toll collection system, the commissioner is required to spend half the remaining money on transportation capital improvements within the corridor and to forward half to the Metropolitan Council for expansion and improvement of bus transit services within the corridor.[39]

Resources

Bay Area Toll Authority Long-Range Plan. (2006, December). http://bata.mtc.ca.gov/pdfs/BATA_Long-Range_Plan.pdf.

This plan identifies toll-funded projects, including the seismic retrofit bridge program, bridge construction projects, and investments in transit operating funding.

The Federal Highway Administration, Tolling and Pricing Program. http://www.ops.fhwa.dot.gov/tolling_pricing/index.htm.

The Office of Innovative Program Delivery offers online and other resources for agencies interested in tolling and pricing programs, particularly pilot program assistance.

National Highway Cooperative Research Program. (2006). Synthesis 364: Estimating Toll Road Demand and Revenue. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_364.pdf.

This report provides a state of the practice for forecasting demand and revenues for toll roads in the United States. The synthesis focuses on models that are used to forecast the demand for travel and reports on results from a survey of state DOTs, toll authorities, bond rating agencies, and bond insurance agencies.

National Highway Cooperative Research Program. (2008). Synthesis 377: Compilation of Public Opinion Data on Tolls and Road Pricing. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_377.pdf.

This report provides an analysis of public opinion on tolling and road pricing across the United States and internationally, and offers a systematic review of how the public feels about tolls and road pricing.

Seattle Department of Transportation. (2009, May). Seattle Variable Tolling Study. http://www.seattle.gov/transportation/tolling_study.htm.

This comprehensive study investigates variable tolling as a strategy to reduce greenhouse gas emissions. It identifies types of tolling and their benefits, establishes Seattle's tolling interests, and evaluates tolling concepts.

Washington State's HB 1773—Imposition of Tolls. (2008). http://apps.leg.wa.gov/billinfo/summary.aspx?bill=1773&year=2007.

This legislation provides a framework for collecting tolls in Washington, gives the legislature the authority to impose tolls on unspecified roads and bridges, and makes the Washington State Transportation Commission responsible for determining toll rates (including variable pricing).

39 Minnesota Office of the Revisor of Statures. (2011). Minnesota Statute 160.93. Retrieved from https://www.revisor.mn.gov/statutes/?id=160.93.

Implement Pay-As-You-Drive Insurance

The Opportunity

State transportation agencies may not play a direct role in the provision of auto insurance to drivers, but they stand to benefit if insurance programs are structured to maximize the life of the infrastructure they maintain. Pay-As-You-Drive (PAYD) auto insurance can help manage transportation demand by giving motorists an option for auto insurance that effectively rewards them for driving less.

Even small reductions during peak demand can lead to significant decreases in roadway congestion, eliminating delays and improving flow.[40] A Brookings Institute report calculated that PAYD insurance implemented in all 50 states could reduce vehicle miles traveled (VMT) by eight percent and save $50-$60 billion a year by decreasing the number of crashes and other driving-related externalities. With PAYD insurance, nearly two-thirds of households would save an average of $270 per car per year. In turn, insurance would become more affordable and the number of uninsured drivers would decrease. One study found that PAYD insurance has the same impact on managing demand as a $1-per-gallon gas tax increase.[41] Decreased congestion through VMT reductions would also result in decreased pressure for highway capacity expansions.

What Is It?

Most automobile insurance rates make only minor distinctions between drivers who log thousands of miles every year (and are thus exposed to significantly greater risks) and those who only travel a few hundred. PAYD insurance supports the actuarial nature of insurance (higher exposure means higher risk), allowing those at lower risk due to less driving to reduce their financial obligation.

PAYD auto insurance premiums are priced per miles driven. While program structures can vary, insurance companies generally divide current premiums by the category of miles reported to the insurer. For example, a $250 premium for 10,000 miles reported becomes 2.5 cents per mile; an $1,800 premium for 15,000 miles equals 12 cents per mile. For the typical driver, premiums would average 6.5 cents per mile.[42] Potential payment methods include:

- Pay the premium based on the expected mileage category; a driver will pay the difference or receive a refund at the end of the policy term, depending on actual miles driven.
- Purchase a lump sum of miles at the start of the policy term and buy more miles if needed or receive credit for unused miles.
- Be billed for usage on a monthly basis, similar to a utility.[43]

PAYD insurance relies on accurate mileage data. Fortunately, there are a number of existing commercially available technology options for collecting data on distance traveled, many of which do

40 Federal Highway Administration. (2008, December*). Examining the Speed–Flow-Delay Paradox in the Washington DC Region: Potential Impacts of Reduced Traffic on Congestion Delay and Potential for Reductions in Discretionary Travel During Peak Periods: Final Report.* Retrieved 5/1/12 from http://ops.fhwa.dot.gov/publications/fhwahop09017/008_section_2.htm#26.

41 The Hamilton Project and Brookings Institution. (2008, July). *Pay-As-You-Drive Auto Insurance: A Simple Way to Reduce Driving-Related Harms and Increase Equity.* Retrieved 3/27/12 from http://www.brookings.edu/~/media/Files/rc/papers/2008/07_payd_bordoffnoel/07_payd_bordoffnoel.pdf.

42 Victoria Transport Policy Institute. "Pay-As-You-Drive Pricing and Insurance Regulatory Objectives." Retrieved 3/27/12 from http://www.vtpi.org/jir_payd.pdf.

43 *Ibid.*

not transmit information about driver location (or can be tailored to remove that capability in order to address privacy concerns). Most new cars already record odometer data electronically onto internal computers. Two potential data collection methods include:

- Installing an odometer tracking device (the "dongle" used by Progressive, for example, plugs into the car's diagnostic port); or
- Installing a GPS tracker such as On Star.

Feasible payment and data collection structures will depend on each state's particular insurance regulations.

Implementation

State transportation agencies can play an important leadership role by taking the following steps to promote PAYD and encourage its adoption.

Enable the offering of PAYD insurance. Most state laws already enable PAYD-type insurance systems. The Georgia Institute of Technology conducted a survey of state insurance commissioners in 2002 to determine whether current regulations explicitly ban PAYD. Of the 43 respondents, 27 said that current laws in their states do not prohibit PAYD.[44] Since the study was conducted, PAYD has become more common; for example, Progressive Insurance offers its Snapshot program, a PAYD product, in 39 states. Some states have passed legislation that explicitly allows insurance companies to offer PAYD.[45]

In some cases, additional legislative changes may be necessary to make PAYD feasible. For example, certain states, such as North Carolina, require that annual insurance premiums be stated upfront.[46] In a mileage-based system, the premium may increase or decrease depending on miles driven; this type of requirement can limit PAYD's attractiveness to drivers if there is no provision for granting a credit if a driver drives less than his original predicted mileage. Some insurance companies currently structure their programs so that this is not an issue; for example, GMAC and Progressive collect data and then provide discounts on future premiums.[47]

Educate drivers about the benefits of PAYD. PAYD insurance has clear benefits, including significant cost savings, for many drivers. PAYD policies vary but, in general, offer discounts for driving less than a set number of miles per year.[48]

Establish broad-based partnerships. Environmental advocates are natural allies because PAYD insurance reduces VMT and emissions. Insurance companies are important partners and tend to be supportive of PAYD because it lowers their risk, which leads to smaller payouts. State insurance commissions are essential partners because of their role in the implementation of the program, and state DOTs can be valuable advocates in helping to pass any necessary legislation.

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44 Guensler, R. et al. (2003). Current State Regulatory Support for Pay-As-You-Drive Automobile Insurance Options. Journal of Insurance Regulation, (Vol. 21, No. 3), p. 31. Retrieved 9/12/2013 from http://transportation.ce.gatech.edu/sites/default/files/files/current_state_regulatory_support_for_pay-as-you-drive_automobile_insurance_options.pdf.

45 *Ibid.*

46 Environmental Defense Fund. "Drive less, pay less for insurance." Retrieved 9/12/2013 from http://www.business.edf.org/projects/innovation-exchange/2008-innovations-review/drive-less-pay-less

47 Center for Insurance Policy and Research. (2012, June 5). "Usage-based insurance." Retrieved 8/8/12 from http://www.naic.org/cipr_topics/topic_usage_based_insurance.htm.

48 See, for example, Progressive's web site: http://www.progressive.com/auto/snapshot-common-questions.aspx. Drivers are discounted for "driving fewer miles than the average driver in your state."

Start with a sizeable market share. Washington's program began with Unigard, a local insurance company. Unigard could only offer up to a five percent savings total, and as of June 2011, only six vehicles were enrolled.[49] California, on the other hand, rolled out PAYD with State Farm, which offers a five percent discount just for signing up for PAYD. State Farm insures 3.5 million California drivers with premiums totaling $2.5 billion.

Run a pilot program. One of the biggest obstacles to widespread adoption of PAYD is a lack of knowledge on the part of insurance companies and state decision makers about how to structure it. A pilot program can be an effective way to test potential payment structures and data collection methods and reduce the start-up costs to insurance companies. It can also be a means to collect state-specific data about the benefits of PAYD, by monitoring changes in driver behavior. State transportation agencies can play an important leadership role and, in many cases, will be in the best position to administer such a program (see the Massachusetts case study below).

Case Studies

California PAYD

Proposition 103, which has guided California's insurance policy since 1988, requires insurance companies to consider three main factors when determining premiums: the driver's safety record, the driver's experience, and annual miles driven. Mileage is self-reported, and there is a wide mileage range for each mileage category. For example, if a range of mileage covered 10,000 to 20,000 miles, a person who drove 10,000 miles a year would pay the same premium as someone who drove 20,000 miles.[50]

In 2008, Assemblyman Jared Huffman proposed and successfully passed legislation that would authorize PAYD. The campaign shared success stories from other states to promote cost savings and capitalized on the rising cost of gas. To address privacy concerns, the legislation does not allow the use of GPS devices to track miles.[51]

The original bill had the support of the Automobile Club of Southern California and State Farm, which began offering PAYD to customers in early 2011. Since then, two more companies have begun offering PAYD in California. State Farm says that, as of April 2012, it is on track to enroll 25 percent of its 3.5 million drivers in California in the PAYD program.[52] The program allows customers to self-report mileage online or through a State Farm agent, or install OnStar in their vehicle.[53]

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49 Rosenberg, M. (2011, November 3). "King County to resuscitate pay-as-you-go insurance model." *Crosscut Public Media*. Retrieved 9/12/2013 from http://crosscut.com/2011/11/03/crosscut-blog/20634/King-County-resuscitate-payasyougo-insurance-model/.

50 The Hamilton Project and The Brookings Institution. (2008, July). *Pay-As-You-Drive Auto Insurance: A Simple Way to Reduce Driving-Related Harms and Increase Equity.* Retrieved 3/27/12 from http://www.brookings.edu/~/media/Files/rc/papers/2008/07_payd_bordoffnoel/07_payd_bordoffnoel.pdf.

51 California Assembly Bill 2800. (2008, August 25). Office of Senate Floor Analyses. Retrieved 9/12/2013 from http://leginfo.ca.gov/pub/07-08/bill/asm/ab_2751-2800/ab_2800_cfa_20080825_113959_sen_floor.html.

52 Gumz, J. (2012, April 12). "Drive less and save: Drivers pleased with program to cut premiums." *Santa Cruz Sentinel*. Retrieved 4/30/12 from http://www.mercurynews.com/breaking-news/ci_20385093/drive-less-and-save-drivers-pleased-program-cut.

53 State Farm web site. Retrieved 1/12/14 from https://www.statefarm.com/insurance/auto/discounts/drive-safe-save/california.

Massachusetts PAYD

In an effort to reduce carbon emissions by 25 percent below 1990 levels by the year 2020, Massachusetts decided to execute strategies for reducing greenhouse gases, including a PAYD program.[54] Costs for fully implementing PAYD in Massachusetts are expected to be about $2.57 million. In 2010, MassDOT received a $2.1 million grant from the FHWA Value Pricing Pilot Program to take on a Pay-As-You-Drive Insurance Pilot Program. Conservation Law Foundation Ventures, the non-profit strategy-consulting arm of the Conservation Law Foundation (CLF), provided a portion of the private match to cover the remainder of the program cost and will conduct the study.[55] Plymouth Rock Assurance Corporation, a local insurance provider, will contribute additional funding and act as insurer for the participants.[56]

MassDOT's Office of Transportation Planning will oversee the implementation of the pilot program in close coordination with the Massachusetts Executive Office of Energy and Environmental Affairs and the Massachusetts Division of Insurance.[57] This pilot program will test a variety of pricing structures, such as a monthly billing system that will provide PAYD customers with "real-time" pricing signals. It will also install on-board telematics devices that will track mileage and driving patterns in control groups of drivers to study the impacts on VMT.[58] Up to 3,000 policyholders will participate in the pilot program, which is expected to launch in 2014 and run for three years.[59]

Before embarking on this pilot program, CLF and the Environmental Insurance Agency commissioned a study that used actual insurance claims in Massachusetts to assess the "risk-mileage relationship." The study analyzed $502 million in claims on about three million cars driven a total of 34 billion miles.[60] The results of the study indicated the soundness of PAYD: if all Massachusetts drivers switched to PAYD, it would create considerable reductions in miles driven, fuel consumption, greenhouse gas emissions, and auto accident losses without harming lower-income drivers.

Resources

The Brookings Institution. (2008, July). Pay-As-You-Drive Auto Insurance: A Simple Way to Reduce Driving-Related Harms and Increase Equity. http://www.brookings.edu/research/papers/2008/07/payd-bordoffnoel.

54 Massachusetts Executive Office of Energy and Environmental Affairs. (2010, December 29). "Massachusetts Clean Energy and Climate Plan for 2020." Retrieved from http://www.mass.gov/eea/docs/eea/energy/2020-clean-energy-plan.pdf.

55 Massachusetts Office of Consumer Affairs and Business Regulation. (2011, January 21). "Bulletin 2011-01; Pay-As-You-Drive Auto Insurance Pilot." Retrieved 7/20/12 from http://www.mass.gov/ocabr/government/oca-agencies/doi-lp/bulletin-2011-01-pay-as-you-drive-auto.html.

56 Conservation Law Foundation , (2013, September 16). "Conservation Law Foundation Announces Study to Measure How Financial Incentives Impact Massachusetts Motorists' Driving Habits" Conservation Law Foundation website. Retrieved 10/16/13 from http://www.clf.org/newsroom/conservation-law-foundation-announces-study-measure-financial-incentives-impact-massachusetts-motorists-driving-habits/.

57 Federal Highway Administration. "VPP Projects Not Involving Tolls Category: Projects That Make Auto Use Costs Variable." Retrieved 7/20/12 from http://www.ops.fhwa.dot.gov/tolling_pricing/value_pricing/projects/not_involving_tolls/autousecostsvariable/ma_payd.htm.

58 Federal Highway Administration. "VPP Projects Not Involving Tolls Category: Projects That Make Auto Use Costs Variable." Retrieved 7/20/12 from http://www.ops.fhwa.dot.gov/tolling_pricing/value_pricing/projects/not_involving_tolls/autousecostsvariable/ma_payd.htm.

59 Conservation Law Foundation, (2013, September 16). "Conservation Law Foundation Announces Study to Measure How Financial Incentives Impact Massachusetts Motorists' Driving Habits." Conservation Law Foundation website. Retrieved 10/16/13 from http://www.clf.org/newsroom/conservation-law-foundation-announces-study-measure-financial-incentives-impact-massachusetts-motorists-driving-habits/.

60 Joseph, F., and Eric, M. (2010, October). "Pay-As-You-Drive Auto Insurance in Massachusetts." Retrieved 7/20/12 from http://mit.edu/jf/www/payd/PAYD_CLF_Study_Nov2010.pdf.

This report makes a strong case for implementing PAYD and quantifies a number of the benefits. It also provides recommendations on how states and the federal government can encourage widespread adoption.

Ferreira, Jr., J., & Minikel, E. (2010, November). Pay-As-You-Drive Auto Insurance in Massachusetts: A Risk Assessment and Report on Consumer, Industry and Environmental Benefits. http://mit.edu/jf/www/payd/PAYD_CLF_Study_Nov2010.pdf.

This study, commissioned by the Conservation Law Foundation and Environmental Insurance Agency, offers an analysis of the risk-mileage relationship based on insurance claims information in Massachusetts.

International Transport Forum. (2011, September). Pay-as-you-drive vehicle insurance as a tool to reduce crash risk: Results so far and further potential. http://www.internationaltransportforum.org/jtrc/DiscussionPapers/DP201123.pdf.

This report provides behavioral and crash analysis on some more mature PAYD programs internationally.

Victoria Transport Policy Institute. “Pay-As-You-Drive Pricing and Insurance Regulatory Objectives.” http://www.vtpi.org/jir_payd.pdf.

This is an excellent resource on the mechanics behind PAYD and pricing options.