

MTP2030 Issue Papers: Highway Lane and Pricing Tolls



The paper introduces three highway pricing concepts: tollways, high occupancy toll (HOT) lanes, and fast and intertwined regular (FAIR) lanes. Definitions, objectives and issues to consider from case studies are offered to assess the opportunities and challenges for highway pricing in the Sacramento region.

DEFINITIONS

Toll Facilities (Tollways)¹: A toll road or turnpike is a highway that requires toll collections from all drivers (usually with the exception of emergency vehicles). Typically, those tolls are used to support operations and maintenance, as well as to pay debt service on the bonds issued to finance the toll facility. Tolls may be collected at a flat rate at toll plazas, or based on distance traveled using tickets, electronic transponders, or video recording of license plates. Many existing, traditional toll roads are converting to some form of electronic toll collection, and most new toll projects incorporate the option to pay electronically.

High-Occupancy Toll (HOT) Lanes²: HOT lanes refer to special use lanes on an otherwise free highway facility. On HOT lanes, low occupancy vehicles are charged a toll, while High-Occupancy Vehicles (HOVs) are allowed to use the lanes free or at a discounted toll rate. Vehicles not meeting HOV occupancy requirements buy the right to use the HOV lanes. HOT lanes have been facilitated by the emergence of electronic toll collection technology.

FAIR Lanes³: "Fast and Intertwined Regular Lanes" or "FAIR lanes" involves separating freeway lanes, typically using plastic pylons and striping, into two sections: "fast" lanes and "regular" lanes. Drivers who pay to participate receive a transponder for their vehicles. The transponders communicate with the electronic toll collection system to record if the driver is using a "fast" or "regular" lane during congested peak-travel periods. The "fast" lanes charge tolls that vary by the time of day and level of congestion. In the "regular" lanes, drivers in the program would be compensated with credits and constricted flow would continue. The credits can then be used as toll payments for use later in the "fast lanes," or as payment for transit, paratransit or parking at commuter park-and-ride lots along the corridor.

Value Pricing⁴: Value pricing, also known as congestion pricing and peak-period pricing, entails fees or tolls for road use which vary with the level of congestion. Fees are typically assessed electronically to eliminate delays associated with manual toll collection facilities.

¹ Washington State Comprehensive Tolling Study Initial Assessment; Working Paper #2: National Perspective: Uses of Tolling and Related Issues, Cambridge Systematics, Inc., November 2005.

² Source: University of Minnesota, Hubert H. Humphrey Institute of Public Affairs Website at <http://www.hhh.umn.edu/centers/slp/projects/conpric/index.htm>, November 28, 2005.

³ Source: Federal Highway Administration, Office of Transportation Policy Studies Website at <http://www.fhwa.dot.gov/policy/otps/valuepricing.htm>, November 28, 2005.

⁴ Source: Federal Highway Administration Website on Value Pricing Pilot Program at <http://www.fhwa.dot.gov/policy/vppp.htm>, November 28, 2005.

Assessing relatively higher prices for travel during peak periods is the same as that used in many other sectors of the economy to respond to peak-use demands. For example, airlines offer off-peak discounts and hotel rooms cost more during peak tourist seasons.

- For existing tollways, toll rates typically do not vary by time of day or day of week. Many planned tollways, however, do incorporate value pricing.
- For HOT and FAIR lane projects, value pricing is used.

Introduction to Case Studies: Examples of highway pricing for the entire facility (toll roads) vs. only select lanes (HOT or FAIR lanes) are described separately in the following sections because of key institutional, design and financial differences. Project goals vary considerably, ranging from profit motive in a toll road example to subsidizing transit services in a highway lane pricing example. Despite the different goals, successful cases are those with adequate demand for a highway pricing application; the willingness to pay is highest on corridors with limited free alternative highway options or high levels of congestion that last for more than just the peak commute periods.

For each case study, relevant information for policy makers is highlighted. By beginning with a discussion of early toll facilities and then expanding to the broad range of active efforts, the paper demonstrates that interest in highway pricing continues to grow. The national and state case studies suggest that the Sacramento region may also see more highway pricing proposals as the region further urbanizes and connections to nearby regions strengthen. In assessing proposals for the Sacramento region, policy makers must consider both the clarity of vision for a candidate corridor and whether or not the highway pricing strategy can be successfully implemented. Moreover, successful case studies demonstrate the need for a clear vision, good design, strong operations and a realistic financial plan so that the benefits outweigh any concerns of equity or fairness.

TOLL FACILITIES

States in the Midwest and East have a long, well-established history of toll roads and toll bridges, dating back to the construction of turnpikes in the 1940s and 1950s before Congress undertook the interstate highway program in 1956.

Most of the early toll turnpikes still operate, typically collecting tolls based on distance. All were built on heavily-traveled corridors of 50 years ago, and all remain heavily used, despite the fact that free interstates have been built elsewhere in those states in the last 50 years. Toll revenues of the early toll roads were initially used to pay off original construction bonds. Later revenues went towards bonds for highway widenings and extensions, and to pay for maintenance and operations. Today, some toll authorities hold substantial reserves and some states, such as Massachusetts, have passed legislation allowing diversion of some revenues to support other roadways.

Toll Bridges in California

California built ten toll bridges during the years from the 1930s to the 1980s. The bridges include the Golden Gate Bridge plus seven in the Bay Area and two in southern California on state highways.

- Institutional management – The Golden Gate Bridge is owned and operated by a public authority, while the other 8 state highway toll bridges in the Bay Area and San Diego have been turned over to regional toll agencies.
- Revenues towards a range of transportation services – Toll revenues pay for bridge operations, maintenance (including seismic retrofit or replacement), bridge improvements and transit service to relieve traffic demand on congested bridges and, in some cases, to fund highway improvements as far as ten miles away in corridors that lead to the bridge.
- Integration with new toll payment technologies – All of the remaining toll bridges in California allow electronic toll collection for drivers possessing a FastPass. Peak pricing was studied and considered for the San Francisco-Oakland Bay Bridge in the late 1990s but not implemented for complex local political reasons.
- Reversion to a free facility – The state paid off bonds in 1998 to revert to free use the Vincent Thomas Bridge in Long Beach.

Automobile Toll Roads in California

California's experience in toll roads is presently limited to the two public toll authorities in Orange County that built four state highway routes (51 miles total) during the 1990s (toll roads with a flat toll rate set by the bond covenants).

- Increased mobility. Collectively, the toll roads reduce congestion by an estimated 20% along I-5 in the county; I-5 is free and runs roughly parallel to the tollways through the southern portion of Orange County. The four toll routes presently carry approximately 200,000 vehicles per day.
- Revenues short of projections. Both Orange County toll authorities have had to refinance debt and are now considering consolidation to allow further debt restructuring. This is because traffic volumes, and thus toll revenues, are lower than projections. It is suggested that the lower traffic volumes are because development immediately beside the corridors has proceeded more slowly than anticipated due to a saturated high-end housing market in Orange County.
- New proposals for toll roads. Following the success of toll roads in the East and Midwest, many fast growing cities in the western US are adding toll roads to their highway networks. The most active efforts are in Dallas, Houston and Denver. For the Sacramento region, the Placer Parkway Preservation Project⁵ represents a preliminary feasibility study investigating whether tolls could be used as a potential revenue source

⁵ **Conceptual Plan; Placer Parkway Interconnect Study**, DKS Associates, January 2000.

on this proposed regional facility. It is being conducted by consultants to the Placer County Transportation Planning Agency.

Truck Lanes and Toll Roads in California

Currently there are no truck toll lanes in California and very few miles of truck-only lanes. The high level of freight traffic in Southern California has led to active proposals for new free and priced truck-only toll lanes, as well as a proposed tollway exclusively for truck traffic.

- **Truck-only Lanes (free)⁶.** The purpose of truck-only lanes is to separate trucks from other mixed-flow traffic to enhance safety and/or stabilize traffic flow.
 - ▶ **An emerging concept.** Very few truck-only lanes exist nationally. California has two truck-only lanes along Interstate 5 (north of Los Angeles), and others are being planned.
 - ▶ **Metrics for success.** A feasibility study report by the Southern California Council of Governments (SCAG) concludes that exclusive truck lanes were most plausible for congested highways where three factors exist: truck volumes exceed 30% of the vehicles, peak-hour volumes exceed 1,800 vehicles per lane-hour, and when off-peak volumes exceed 1,200 vehicles per lane-hour.
- **Truck-only Toll Lanes (priced):** Truck toll lanes have the same purpose as the free truck-only lanes, but are proposed where the truck traffic is highest. Caltrans proposes a \$5.5 billion overhaul of an 18-mile stretch of Interstate 710 in Los Angeles County that will link the Ports of Los Angeles and Long Beach to the Pomona Freeway.
 - ▶ Revenue Generation. Studies suggest that container fees and tolls could produce up to \$1.4 billion in capital funding for the I-710 improvements.
 - ▶ Design. The Locally Preferred Strategy calls for widening the freeway to 14 lanes from the existing 6 to 10 lanes, adding a four-lane truck facility.
- **Truck-Only Tollway:** SCAG's long-range transportation plan proposes a 140+ mile, \$16 billion truck-only tollway from the ports of Los Angeles and Long Beach out I-710 to Route 60 to I-15 to Barstow. The facility would be financed and paid for with tolls of \$60 per truck trip.

HIGHWAY LANE PRICING

In contrast to toll roads, two new highway pricing concepts (HOT and FAIR lanes) involve variable pricing for only select lanes of an otherwise free highway. The following sections describe typical objectives for implementing these projects, relevant case studies, and issues to consider.

There are a variety of objectives for implementing highway lane pricing strategies. Objectives are described as primary or secondary.

⁶ Caltrans **Truck-Only Lanes Fact Sheet**, Caltrans Traffic Operations Program-Office of Truck Services, May 2004.

Primary Objectives

- **Enhance corridor mobility.** Value pricing by the level of congestion provides incentives to shift some trips to off-peak times, less congested routes, or alternative modes. Mobility is further advanced by causing some lower-valued trips to be combined with other trips, or to be eliminated. A shift in a relatively small proportion of peak-period trips can lead to substantial reductions in overall congestion.
 - ▶ **Reduce travel-times/vehicle hours of travel.** A key benefit from enhanced mobility is the time savings to travelers.
 - ▶ **Improve travel-time reliability.** Variability of travel times due to congestion (peak-periods especially) may also result from enhanced corridor mobility.
- **Generate revenue.** Revenue received can go towards various purposes, including the construction of a highway facility, ongoing highway operations and maintenance, or subsidies towards transit and ridesharing.

Secondary Objectives

- **Provide equity.** Because highway lane pricing creates the opportunity for paying drivers to avoid congestion, some critics have charged that the facilities are elitist and serve primarily affluent users at the expense of middle and low-income motorists. In response to this concern, a common objective is to make sure that any highway pricing benefits are equitably distributed, not disproportionately enjoyed by only users that can afford to pay. Highway pricing can be structured to provide transit subsidies and/or no-pay or discount options
- **Improve under-utilized HOV facilities.** One form of highway lane pricing, HOT lanes, may enhance efficiency of HOV lanes and respond to negative public opinion about underutilized HOV lanes.
- **Promote transit and ridesharing.** Highway lane pricing is often implemented with strategies to use the revenue generated to provide transit subsidies and to stimulate carpool formation to increase average vehicle occupancy.
- **Reduce mobile source air pollution emissions.** To the extent that vehicles will drive at steady speeds versus stop-and-go in congestion a marginal reduction in air pollution emissions may result.

Existing and Planned Highway Lane Pricing Examples

Highway lane pricing case studies from other regions are only generally applicable to candidate corridors in the Sacramento region. Lessons learned regarding geometric design standards, signing, and toll collection technologies have relevance, but capital costs and revenues generated are less applicable.

(1) State Route 91 (SR-91) Express Lanes – Orange County, California grew out of a desire to increase capacity in a heavily congested corridor. SR-91 Express Lanes is a 10-mile, four-

lane, HOT controlled access facility located in the median of an existing highway. The project was privately constructed but is now operated by a public agency.

- **Construction and Ongoing Operations:** The SR-91 Express Lane project was awarded on a concession basis to a private consortium, which financed, built, and operated the new lanes, using project revenues to repay its debt and derive profit. The facility has been sold to the Orange County Transportation Authority (OCTA) who now operates it.
- **Pricing:** Toll rates on the Express Lanes vary from \$0.75 to \$4.75 by time of day and day of week. Customers must have a prepaid account and transponder to use the Express Lanes. Tolls for HOV/2+ vehicles are reduced by 50 percent.
- **Use Patterns:** The HOT lanes are being used differently than expected. The private interests that built and initially operated the facility expected a modest number of higher income drivers to buy passes and then to use the lanes regularly. In contrast, four times as many drivers as expected have passes, but they don't use them regularly; most drivers with passes only use the HOT lanes 1-2 days per week when timely or fast travel is imperative or an accident congests the main lanes.
- **Socio-economic Equity**⁷: As described in the objectives section, critics often suggest that highway lane pricing primarily serves affluent users at the expense of middle and low-income motorists. Actual data on SR-91 HOT lane use largely dispel this charge. Studies of the SR-91 Express Lanes indicate a statistically significant correlation between income and frequency of toll lane use, but also reveal that three-quarters of the users at any one time are from households with incomes below \$100,000/annually.⁸

(2) **I-15 FasTrak in San Diego** grew out of a desire to utilize spare capacity on the HOV lanes as well as the desire to cross-subsidize transit service in the corridor. The I-15 FasTrak involved the conversion of an under-utilized pre-existing 8-mile, two-lane HOV facility to a peak-period reversible HOT lane facility.

- **Pricing:** The I-15 FasTrak program allows single occupancy vehicles to pay a toll ranging from \$0.50 to \$4.00 to use the HOT lanes normally reserved for vehicles with two or more occupants. Customers must have a FasTrak account and transponder to use the HOT lanes. HOV/2+ vehicles may use the facility at no cost.
- **Construction and Ongoing Operations:** The project was completed and continues to be operated by the San Diego Association of Governments (SANDAG) which has earmarked a significant portion of the revenues derived from the HOT-lane fund to transit improvements on the I-15 corridor.

(3) **Katy Freeway HOT Lanes (QuickRide Program) in Houston** seeks to obtain more productivity out of underutilized HOV lanes. The Katy Freeway is an existing 13-mile, six-lane freeway with one reversible HOV lane in the median which was recently converted to HOV/3 to reduce HOV-lane congestion. Excess capacity of the HOV/3 facility led to the introduction of an HOT lane (QuickRide) program.

⁷ **A Guide for HOT Lane Development**, Parsons Brinkerhoff, Texas Transportation Institute, and U.S. Department of Transportation Federal Highway Administration, March 2003, Page #28.

⁸ **Continuation Study to Evaluate the Impacts of the SR-91 Value-Priced Express Lanes: Final Report**, State of California, Department of Transportation, December 2000.

- **Pricing:** HOV/2 vehicles pay \$2.00 per trip to use the facility during peak periods, while HOV/3+ vehicles continue to use the facility at no cost. Customers must have a QuickRide account, transponder and windshield tag to use the facility.

(4) I-680 Smart Carpool Lane Project – Alameda County, California will be the Bay Area’s first HOT-Lane study of value-pricing HOV lanes. It is a four-year demonstration project on a 14-mile stretch of Interstate 680 between Pleasanton and Milpitas, commonly referred to as the Sunol Grade.

- **Institutional issues:** The Sunol Grade portion of Interstate 680 is, by voter-approved ordinance, required to operate new value-priced HOV lanes. The project is a joint effort of the Metropolitan Transportation Commission (MTC), Alameda County’s Congestion Management Agency, Caltrans, and the Federal Highway Administration (FHWA).
- **Design:** The HOV/HOT lane will be delineated from the three other lanes with striping, which is less expensive and more flexible than physical barriers.
- **Pricing:** The highest peak-hour tolls will likely range from \$0.22 to \$0.38 per mile and the tolls will be collected through the FasTrak system – an electronic reader identifies the vehicle from an in-vehicle transponder and deducts the toll amount from a prepaid account. The tolls can be adjusted to keep pace with traffic conditions.
- **Projected Revenues:** The cumulative net income over 20 years for HOT lanes in both southbound and northbound directions is estimated to be between \$83 and \$142 million under the current HOV/2 (two-person carpool) policy.

(5) US-50 High Occupancy Toll (HOT) Lane Strategy Evaluation⁹: A feasibility study on the cost-effectiveness of converting HOV lanes into HOT-lanes between Sunrise Boulevard and downtown Sacramento was completed in September 2005 by consultants for Caltrans, District 3. It concludes that the HOT-lanes are not currently cost-effective for two primary reasons: projected congestion levels were not high enough and increased time costs from limiting access to the HOT lanes.

- **Projected congestion levels not high enough.** The forecasted levels of congestion in the US 50 study did not produce enough congestion to make the HOT lane attractive to potential users at the toll prices assumed.
- **Increased time costs.** The study assumes a limited number of access points that in the model scenarios force a number of HOVs to use the general-purpose lanes; these HOVs experience increased time costs, which leads to more congestion in the general-purpose lanes that result in increased time costs to other travelers.
- **New Technologies may result in lower costs and higher benefits.** The study authors note that the cost-effectiveness of HOT lanes along US 50 could improve significantly with emerging technologies. GPS-based HOT lane technologies, being studied in Seattle may allow vehicles to freely enter and leave the HOT lanes, thereby reducing the time cost problems from limited access points in the US 50 study assumptions.

⁹ **US 50 High Occupancy Toll (HOT) Lane (Sunrise Blvd. to Downtown Sacramento) Strategy Evaluation,** Dowling Associates, September 2005.

(6) **I-580 / I-680 FAIR Lanes Study – Alameda County, California**¹⁰ investigates the potential for implementing the new Fast and Intertwined Regular (FAIR) lanes concept along two East Bay corridors and will be coordinated with the concurrent “I-680 Smart Carpool Lane Project” study.

FACTORS TO CONSIDER FOR HIGHWAY LANE PRICING

The case studies demonstrate that there are a number of issues that should be considered when considering highway lane pricing applications.

Policy and Institutional Issues

- **Overall system philosophy – why highway pricing?** A successful highway pricing application must determine if there is adequate demand. Considerations include:
 - ▶ **Determine levels of congestion.** Does corridor demand (today and during the planning period) exceed capacity by moderate or high levels?
 - ▶ **Determine duration of congestion.** How many hours of the day is the free corridor (today and during the planning period) congested?
 - ▶ **Determine level of HOV use.** Will there be spare capacity in the HOV lanes not used by HOVs today or in the future? This analysis is specific to possible HOT lane applications.
- **Initial agency considerations.** Critical efforts include defining agency roles and types of participation in the development of a highway pricing project.
 - ▶ **Define the vision.** Will highway pricing be implemented as a corridor management tool? Is the facility an isolated corridor improvement, or will it be connected to other toll or HOT lane facilities?
 - ▶ **Establish project goals.** Clear and decisive goal setting may include relieving congestion or promoting transit use and ridesharing.
 - ▶ **Public or Private?** Determine the optimal public/private balance between the construction and ongoing management of the facility.
 - ▶ **Address equity and fairness concerns.** This is particularly an issue with HOT lanes where it is important that benefits are equitably distributed, not disproportionately enjoyed by only users that can afford to pay.
 - ▶ **Establish criteria for success.** Develop monitoring and evaluation plans that may include system performance measures.
 - ▶ **Encourage public involvement.** A public outreach/awareness campaign and active public involvement throughout the evaluation and design process can help address concerns and generate public acceptance of a highway pricing concept.

¹⁰ **Managed Lanes: Strategies Related to HOV/HOT**, White Paper prepared by the TRB HOV Systems Committee (A3A06), September 2003.

Design, Operational and Safety Issues

■ Design considerations

- ▶ **Will the highway HOV/HOT lanes monitor access through “buffers”?** HOV/HOT lanes on highways with inadequate rights-of-way (ROW) typically have contiguous/buffer-separated access (cones, striping, etc.) between the free and priced lanes, though GPS-based technologies promise the opportunity for vehicles to freely enter and leave the HOT lane without any “buffers”.
- ▶ **Will the highway HOV/HOT lanes control access with a “barrier”?** Highways with HOV/HOT lanes that have physical barriers limiting access points are the easiest to monitor. One key design issue is whether the lanes will be dynamic reversible-flow lanes or static two-way lanes. A second design challenge is the terminal treatments at ingress and egress locations. These are the diverge areas at the beginning of HOV/HOT lanes, merge areas, and lane-drops at end of HOV/HOT lanes.

■ Operations

- ▶ **Select the best toll collection technology.** The most common approach to electronic toll collection is via in-vehicle transponders and readers at HOT-lane entry and exit locations.
- ▶ **Enforce payment for access to the fast lanes.** Considerations include the amount of on-going enforcement and the number/location of enforcement areas. Enforcement of contiguous/buffer-separated HOT-lanes may prove more difficult than enforcement of barrier separated HOT-lanes.

■ Safety

- ▶ **Design for safety.** Optimally, the HOT lane has a cross-section design with adequate shoulder widths to accommodate disabled vehicles and accident clearance.
- ▶ **Establish appropriate policies.** The Caltrans Freeway Service Program is an example of a coordinated policy with provisions for the timely clearance of disabled vehicles.

Economic and Financing Issues

■ Construction/Financing Issues

- ▶ **Estimate Capital costs.** This analysis involves reviewing the difference between retrofit and new construction, any additional right-of-way costs, and the need for grade separations, etc.
- ▶ **Select the optimal financing mechanism.** Capital financing options may involve bonds, supplemental sales taxes, etc.
- ▶ **Define ownership and governance for the facility.** The financing and ongoing operation costs vary greatly between a publicly owned and a public/private venture.

■ Revenue Issues

- ▶ **Determine who will pay.** Primary considerations involve determining if the two person HOVs will be free. Will there be variable pricing for SOVs? Will trucks be allowed and charged?
- ▶ **Establish a toll pricing strategy.** Distance based tolls or flat rates independent of distance traveled toll lanes? Tolls varied by vehicle type and occupancy (e.g. trucks, SOVs, HOV 2 or 3 person)? It is also important to determine if the tolls are constant over time or if tolls increase over time (e.g., tied to inflation index or to construction cost index).
- ▶ **Consider issues that seriously limit revenue generation.** Is the projected congestion high enough to attract enough use? For HOT lanes, the length of facility is also important to consider. A short facility may have little revenue generating capability unless it is a critical bottleneck (i.e., bridge, tunnel, pass, etc.).
- ▶ **Determine how the revenue will be used.** Will the revenue go towards operations and improvements to the facility, or will a portion of the revenues go towards subsidizing other transportation investments or programs? (e.g., transit subsidies, rideshare programs, etc.).