HOV/HOT Lanes

FEBRUARY, 2007

Easing Traffic Congestion

I-5, HOV Lane, Orange County

Traffic congestion continues to be a significant issue in metropolitan areas throughout the country. Transportation agencies at the federal, state, metropolitan, and local levels are using a variety of techniques and approaches to improve traffic flow, enhance mobility, and provide travel options.

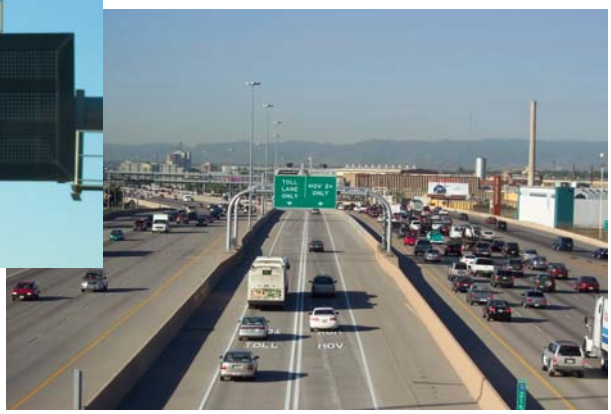
High-occupancy vehicle (HOV) lanes offer an approach in some areas to ease traffic congestion. HOV lanes provide travel time savings and improved trip time reliability to encourage travelers to change from driving alone to carpooling, vanpooling, or riding the bus. HOV/high-occupancy toll (HOT) lanes expand the allowed user groups to include solo drivers or low-occupant vehicles, access the lanes by paying a fee.

HOV/HOT lanes provide mobility options to travelers in congested travel corridors. The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) allows increased flexibility for state departments of transportation and other agencies in maximizing the use of HOV facilities. SAFETEA-LU provisions allows tolled vehicles use of HOV lanes with available capacity.

This brochure, provided by the Federal Highway Administration (FHWA), highlights the HOV/HOT concept and illustrates examples of current projects. Factors influencing the development of these projects are described, along with the benefits realized to date.

Sources to obtain more information on HOV/HOT lanes are highlighted on the last page of the brochure.

INSIDE:



I-25 Express Lanes, Denver

What are HOV/HOT Lanes?

I-10 West HOV Lane, Houston

High-Occupancy vehicle (HOV) lanes are one approach used in some metropolitan areas throughout the country to help improve the people moving capacity rather than vehicle-moving capacity of congested freeway corridors. The travel time savings and improved trip time reliability offered by HOV lanes provide incentives for individuals to change from driving alone to carpooling, vanpooling, or riding the bus.

HOV lane applications have evolved over the past 35 years. Early projects focused primarily on bus-only facilities. Carpools became the dominate user group on most HOV lanes in the 1970s and 1980s. Currently, freeway HOV lanes are in operation in metropolitan areas in 20 states.

In the 1990s, a few areas began experimenting with value pricing projects, often called high-occupancy toll (HOT) lanes, which were allowed under the Value Pricing program in previous federal legislation.

HOV/HOT lanes expand the allowable user groups to include single-occupant or lower-occupanct vehicles for a fee, while maintaining free travel to qualifying HOVs. HOV/HOT lanes enhance mobility and travel options in congested corridors.

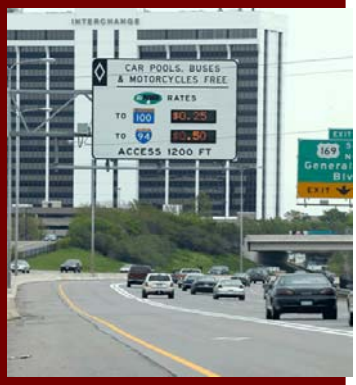
SAFETEA-LU provides additional flexibility to operating agencies to allow exempt user groups when available capacity exists on an HOV lane. Tolling single occupant vehicles represents one of the exempt user groups. In addition, the introduction of electronic toll collection (ETC) and other advanced technologies provide greater opportunities for pricing applications on HOV lanes.

SAFETEA-LU provides flexibility in expanding HOV lane user groups to include toll vehicles and energy-efficient vehicles

SAFETEA-LU

SAFETEA-LU contains a number of provisions relating to HOV facilities. SAFETEA-LU provides operating agencies with the flexibility to allow certain vehicles not meeting the occupancy requirements, including tolled single-occupant or lower-occupant vehicles.

The Act requires operating agencies to monitor, evaluate, and report on the use of the lanes by these vehicles, and to limit or discontinue their use if the operation of a facility becomes degraded. SAFETEA-LU defines a degraded condition if vehicles using the facility fail to maintain a minimum average operating speed 90 percent of the time over a consecutive 180-day period during the morning or evening weekday peak-hour periods. The minimum operating speed is defined as 45 mph when the posted speed limit is 50 mph or greater.



I-394 MnPASS, Minneapolis

HOV/HOT Projects

Information on HOV/HOT projects in San Diego, Minneapolis, Denver, Salt Lake City, and Houston is highlighted on the next pages. Projects in the planning and development stages in Seattle and other areas are also summarized.

A few common themes emerge from the case study examples. These themes include multi-agency involvement in projects, the need for state legislation to allow for tolling, and maintaining flexibility to make operational adjustments as needed. The case studies also indicate that HOVs — carpoolers, vanpoolers, and bus riders — continue to be the major user groups on HOV/HOT lanes.

I-15 Express Lanes, San Diego

I-15 Express Lanes, San Diego

The I-15 Express Lanes in San Diego represent the first HOV facility in the country to expand to an HOT project. During the initial phase, which began in 1996, between 500 and 700 monthly permits were sold to motorists on a first-come, first-serve basis for $50 to $70.

The ETC phase was introduced in 1998. The FasTrack™ Express Lanes use variable electronic toll collection. The fee depends on the congestion level in the HOV lanes and is recalculated each six minutes to maintain free flow conditions. Fees typically range from $0.50 to $4.00 according to the time of day relative to traffic peaks, although the fee could reach as high as $8.00. Message signs located before the start of the lanes display the updated fee.

The initial demonstration project and the ongoing operation of the Express Lanes represent the joint efforts of the San Diego Association of Governments (SANDAG), the California Department of Transportation (Caltrans), the Metropolitan Transit System (MTS), and the California Highway Patrol (CHP). SANDAG is responsible for overall project management, Caltrans operates the HOV lanes, and MTS operates bus service in the corridor. CHP is responsible for enforcement, which is done visually at the entry point to the facility.

The I-15 two-lane barrier-separated HOV facility opened in 1988, with a 2+ vehicle-occupancy requirement. The eight-mile long facility operates inbound toward downtown San Diego in the morning and outbound in the afternoon. There is one entrance and one exit to the facility.

By 1996, approximately 1,800 vehicles were using the HOV lanes during the morning peak-hour. The adjacent freeway lanes were congested, while capacity was available in the HOV lanes.

Interest in considering pricing on the HOV lanes emerged during the examination of potential transportation control measures in the regional air quality plan. The pricing approach was supported by the mayor of a suburban community in the corridor. This individual was elected to the State Assembly and sponsored the enabling legislation needed for the project.

As of March 2005, there were approximately 18,670 active FasTrak™ accounts and some 27,700 transponders in use. In 2004 and 2005, the daily weekday average traffic using the I-15 Express Lanes ranged from a high of 22,341 in March 2004 to a low of 19,401 in February 2005. Over this time period, HOVs accounted for approximately 75 percent to 78 percent of the total vehicle volumes. FasTrak™ users accounted for most of the remaining 22 percent to 25 percent. Annual revenue generated from FasTrak™ users is approximately $1.2 million.

The revenue has been used to support operations of the system and to expand public transportation services in the corridor. The Inland Breeze bus service provides express trips into downtown San Diego and reverse commute trips to suburban destinations in the corridor.

Inland Breeze Bus, San Diego

I-394 MnPASS, Minneapolis

MnPASS allows solo drivers to use the HOV lanes on I-394 for a fee. Dynamic pricing is used, with tolls based on the level of congestion in the HOV lanes. The base toll is $.25 and the maximum toll is $8.00.

MnPASS, which was implemented in 2005, represents the first use of tolling in the Minneapolis-St. Paul metropolitan area. MnPASS also represents the first HOV/HOT project in the country on concurrent flow HOV lanes.

Drivers must have a valid MnPASS transponder displayed on the front windshield to use the lanes without meeting the vehicle-occupancy requirement. MnPASS transponders can be purchased on-line and at the MnPASS Customer Service Center.

MnPASS represents a partnership of the Minnesota Department of Transportation (Mn/DOT), Metro Transit, the Minnesota State Patrol, and local communities.

I-394 HOV Lanes, Minneapolis

The I-394 HOV lanes are approximately 11 miles in length and include two different designs. A three-mile, two-lane, barrier-separated reversible section is located directly to the west of downtown Minneapolis. To the west of this segment are seven miles of concurrent flow HOV lanes. The reversible lanes provide direct connections with three downtown parking garages, which include bus stops and passenger waiting areas, reduced parking fees for carpoolers, and links to the downtown skyway pedestrian system.

The complete I-394 HOV system was opened in 1992. Although the HOV lanes were well used, averaging between 900 and 1,000 vehicles in the concurrent flow section during the peak hour, interest in considering HOT applications emerged in the early 2000s to help maximize use of the lanes.

In 2003, state legislation was approved allowing the HOT project on I-394. A task force, comprised of 22 individuals appointed by the Governor, the Lieutenant Governor, and communities in the corridor, was formed to help oversee the project.

MnPASS was undertaken to meet a number of objectives. These objectives include increasing the efficiency of I-394 by increasing the person and vehicle-carrying capabilities of the HOV lanes, maintaining free flow speeds for transit and carpools in the HOV lanes, and improving highway and transit in the corridor with project revenues. Other objectives focus on developing ETC and advanced technologies to facilitate dynamic pricing and in-vehicle enforcement.

MnPASS implementation activities included restriping the concurrent flow HOV lanes to change from unlimited to limited access, installation of the ETC and electronic enforcement systems, and marketing the sale of MnPASS transponders, which are available on-line and at the MnPASS Customer Service Center. The MnPASS operating hours on the concurrent flow segment were initially expanded to 24/7. The hours were changed back to the peak-hour, peak-direction after the 24/7 operation caused traffic congestion in the off-peak travel direction.

The sale of MnPASS transponders and use of the lanes have grown since 2005. Some 9,000 transponders have been sold. Traffic counts from mid-2006 recorded 1,756 vehicles using the concurrent flow section in the morning peak hour. HOVs accounted for 63 percent of the traffic, tolled vehicles comprised 32 percent, and some 5 percent were toll violators.

MnPASS represents the first application of tolls in Minnesota.

I-25 Express Lanes, Denver

In June 2006, toll paying solo drivers were allowed to use the I-25 HOV lanes. The Express Lanes use ETC, with pre-set variable pricing by time of day. The current fees range from a low of $.50 on Saturdays, Sundays, and off-peak periods to a high of $3.25 during peak times.

Solo drivers must obtain a transponder and maintain an active account to use the Express Lanes. The transponders can also be used on the E-470 and the Northwest Parkway toll facilities.

The development and operation of the HOV lanes and the Express Lanes represent the coordinated efforts of the Colorado Department of Transportation (CDOT) and the Regional Transit District (RTD). The Colorado Tolling Enterprise (CTE), a part of CDOT, assumed operating responsibility when the Express Lanes were initiated.

The Colorado State Patrol and the E-470 Tollway Authority are responsible for enforcement of the I-25 Express Lanes. Video enforcement is used to identify vehicles without valid toll tags.

The I-25 Express Lanes use the same toll tag technology as the toll facilities in the area.

The I-25 HOV lanes were opened in the mid-1990s. Called the *Downtown Express*, the HOV lanes are seven miles in length. The barrier-separated facility includes two lanes with shoulders on each side. Access is provided at both ends of the lane. The lanes operate in the inbound direction toward downtown Denver in the morning and in the outbound direction in the afternoon. A 2+ vehicle-occupancy requirement is used.

Although carpool, vanpool, and bus use of the HOV lanes was good, available capacity existed. Consideration of expanding the eligible user groups to include toll paying solo drivers began in the late 1990s. Enabling legislation was approved in 1999 to allow HOT projects in the state.

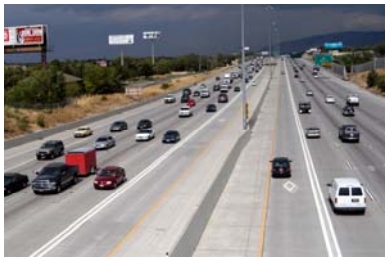
Implementation of the Express Lanes included adding ETC and new signs along the facility. Drivers entering the Express Lane self-declare as HOV or toll-paying vehicles by using the appropriate access lane.

Traffic counts taken in November 2006, 6 months after implementation of the HOT project, show toll vehicles accounting for between 28 percent and 32 percent of the vehicles using the facility. Of the total 1,043 vehicles using the lanes in the afternoon peak hour, 287, or 24 percent, were tolled vehicles, and 756, or 73 percent, were HOVs. In the morning peak hour, tolled vehicles represented 32 percent of the total 899 vehicles, while HOVs accounted for 68 percent. The travel time for buses and carpools has remained relatively constant.

I-25 Express Lanes, Denver

I-15 Express Lanes, Salt Lake City

I-15 Express Lanes



The I-15 Express Lanes in the Salt Lake City area represent the most recent expansion of an HOV lane to an HOV/HOT lane by allowing solo drivers who pay a monthly fee. At 38 miles in length, the I-15 Express Lanes represent the longest HOV/HOT facility in the country.

Solo drivers, who pay a monthly fee, began using the I-15 HOV lanes in September 2006. The Utah Department of Transportation (UDOT) is the lead agency for the Express Lanes. The Utah Highway Patrol (UHP) is responsible for enforcing use of the Express Lanes.

The Express Lanes' pilot project uses branded window decals to identify registered HOT vehicles. The color of the decals, which must be placed on the front and rear windows of a vehicle, changes monthly.

The Express Lanes' decals are only available through credit card purchase on-line at UDOT's Internet site. Initially, 600 decals were available for $50 a month on a first-come, first-serve basis. After the first few months of operation indicated that more HOT vehicles could be accommodated, the number of available decals was increased to 1,350.

The on-line registration site informs interested participants if decals are available. Participants can sign up on a waiting list for automatic notification as decals become available.

Once enrolled, a participant automatically receives a decal for the next month and $50 is charged to the on-file credit card. Participants must cancel before the 15th of the month to terminate participation.

The I-15 HOV lanes opened in segments in the late 1990s and early 2000s. The concurrent flow HOV lanes operated on a 24/7 basis, with unlimited access. Use of the HOV lanes averaged between 650 to 750 vehicles during the peak hour in the peak direction of travel.

UDOT estimated that the lanes could accommodate up to 1,500 vehicles per hour, while maintaining a minimum speed of 55 mph. Under the provisions of SAFETEA-LU, the Utah State Legislature provided UDOT with the authority to allow tolled vehicles to use the HOV lanes in the Spring of 2005. Based on the results of a UDOT feasibility study, the Utah Transportation Commission approved implementation of the Express Lanes pilot program in the Spring of 2006.

Implementation activities included restriping the lanes to change from unlimited access to limited access at designated points. A double white line was added providing a two-foot buffer between the general-purpose lane and the Express Lanes. The access points are designated by a dotted white line.

During the afternoon peak-hour, some 1,400 vehicles are using the Express Lanes in the peak travel direction, but the split between HOVs and HOTs is not known at this time. Travel speeds have remained relatively constant.

Some changes have been made in response to feedback from users and the public. Changes include adding three new access points, relocating two access points, and increasing the length of the access points from 2,000 feet to 3,000 feet. Enhancements were also made to signs in the corridor.

The Express Lanes pilot program is scheduled to operate until 2009, when a decision will be made to convert to ETC or to revert to HOV-only operation.

The Express Lane decals are sold only on-line. Participants automatically receive decals each month, which are charged to their credit card.

I-10 West & US 290, Houston

The QuickRide Program allows two-person carpools to use the I-10 West and the US 290 HOV lanes during the peak hours when a 3+ requirement is in effect.

The *QuickRide* program allows two-person carpools to use the HOV lanes on I-10 West and US 290 for a $2.00 per trip fee during the time periods when a 3+ vehicle-occupancy requirement is in effect. Individuals are required to register for the program and must have an active electronic tag account.

The *QuickRide* program operates from 6:45 a.m. to 8:00 a.m. and 5:00 p.m. to 6:00 p.m. on the I-10 West HOV lane and from 6:45 a.m. to 8:00 a.m. on the US 290 HOV lane. The *QuickRide* program is the only HOV/HOT project that allows two-person HOVs to pay a fee to use an HOV facility, while restricting solo drivers.

The *QuickRide* program was initiated on I-10 West in 1998 as a way of maximizing use of the HOV lane during the 3+ operating periods.

The *QuickRide* program was expanded to include US 290 in 2000. Daily use of the *QuickRide* program has remained relatively constant. When the program started, some 120 participants were using *QuickRide* on I-10 West. By 2003, *QuickRide* users on both lanes were averaging 210 two-person HOVs.

Buses and 3+ carpools continue to represent the majority of users on I-10 West and US 290. Additional options, including allowing tolled solo drivers to use the HOV lanes, continue to be considered.

In addition, the expansion of the I-10 West Freeway includes converting the HOV lane to two managed lanes in each direction. Buses and 3+ carpools will be allowed to use the managed lanes for free, while two-person carpools and solo drivers will pay a toll.

Houston HOV Lane System

The I-10 West HOV lane is 13 miles in length, and the US 290 HOV lane is 14 miles long. Both HOV lanes are one-lane, reversible, barrier-separated lanes, located in the freeway median.

The I-10 West and US 290 HOV lanes are part of a 104-mile HOV lane system in Houston. Components of the HOV system include the HOV lanes, 28 park-and-ride and park-and-pool lots, transit centers, direct access ramps, express bus services, and rideshare programs.

Planning, designing, and operating the HOV system represents a joint effort of the Texas Department of Transportation (TxDOT) and the Metropolitan Transit Authority of Harris County (METRO). The operation of HOV lanes has evolved over time. Only buses and authorized vanpools were allowed to use the I-45 North contraflow lane, which opened in 1979 as the first HOV lane in the area.

Buses and authorized vanpools were allowed to use the I-10 West HOV lanes, which opened in 1984. Based on available capacity, authorized four-person carpools were quickly added to the user groups. Carpool occupancy was lowered to 3+ then to 2+.

At the 2+ level, the HOV lane became too congested, degrading the travel time savings and trip time reliability transit riders had come to expect. As a result, the occupancy requirement was increased to 3+, first during the morning peak hour and later during the afternoon peak hour. The *QuickRide* program helps maximize use of the lanes during the 3+ periods.

HOV/HOT Projects in the Planning Stage

Additional HOV/HOT projects are in various stages of planning and implementation in other areas. SR 167 in Seattle highlighted below is scheduled to open in 2008.

In the San Francisco Bay area, a HOT project is being considered on I-680. In northern Virginia, public/private partnerships are under consideration to develop HOT lanes along I-495, I-395, and I-95. HOT related studies have been conducted in Atlanta and Miami.

SR 167, Seattle

A simulated photo of the SR 167 HOV lanes converted to HOT lanes.

HOV lanes are an integral part of the transportation network in the Puget Sound region. Most of these facilities are concurrent flow HOV lanes, which operate on a 24/7 basis.

The HOV lanes represent the coordinated efforts of the Washington State Department of Transportation (WSDOT), Sound Transit and other transit agencies, local communities, and the Washington State Police. Other supporting components of the HOV system include express bus services, transit centers, park-and-ride and park-and-pool lots, direct access ramps, and carpool and vanpool programs.

Most of the HOV lanes operate at or near capacity during the peak periods. Available capacity exists in some facilities during the peak periods and during other times. Interest in HOT applications emerged during the early 2000s as one approach to increasing the efficiency of some HOV lanes in the region.

Four HOV lanes in the region were considered for the HOT pilot program. The SR 167 HOV lanes were selected due to available HOV lane capacity, peak-hour congestion on the freeway, and the ability to make minor roadway modifications. The Washington State Legislature approved a four-year HOT pilot program.

Implementation of the pilot program includes restriping, changing from unlimited access to limited access, installation of ETC, and other enhancements. The pilot HOT project is scheduled for implementation in 2008.

The SR 167 HOT pilot project is scheduled to open in 2008.

For More Information

Ms. Jessie Yung, P.E.
Federal Highway Administration
1200 New Jersey Avenue, S.E.
E84-409, HOTM-1
Washington, D.C. 20590
Voice: (202) 366-4672
E-mail: Jessie.Yung@dot.gov

Interested in more information on HOV/HOT projects? FHWA has numerous publications available on HOV lanes, HOT projects, and managed lanes. Many of these reports are available through the FHWA Website and the HOV Pooled-Fund Study (PFS) Website.

FHWA: http://www.fhwa.dot.gov/

HOV PFS: http://hovpfs.ops.fhwa.dot.gov/index.cfm

U.S. Department of Transportation
Federal Highway Administration

Prepared by:
Katherine F. Turnbull
Texas Transportation Institute
Part of the Battelle Team supporting the
FHWA Office of Operations
February, 2007

Photo Credits

Page 1 — Federal Highway Administration/Parsons Brinckerhoff and David Ungemah

Page 2 — Texas Transportation Institute and Minnesota Department of Transportation

Page 3 — San Diego Council of Governments

Page 4 — Minnesota Department of Transportation

Page 5 — Colorado Department of Transportation and David Ungemah

Page 6 — Utah Department of Transportation

Page 7 — Metropolitan Transit Authority of Harris County and Texas Transportation Institute

Page 8 — Washington State Department of Transportation

CONGESTION PRICING: SAFETY

Congestion pricing is a system where motorists pay a user fee to drive on the city's most congested roadways. Fees, collected through electronic transponders, correspond directly to the level of congestion, and are higher during the most congested times and lower or free during non-peak periods. This strategy has been shown to effectively reduce traffic congestion in San Diego, Minneapolis, Denver, Houston, and in other countries like, Singapore, United Kingdom (London), and Sweden (Stockholm). While this strategy has been proven to provide reliable travel, other potential benefits have yet to be fully studied and evaluated. There is limited data to show the potential impact of congestion pricing on safety.

I-394 MnPass, Minneapolis, MN

According to the MnPASS Technical Evaluation Final Report (November 2006), in the 2 years preceding the implementation of MnPASS, an average of 414 crashes were observed on I-394– 409 crashes in 2003 and 419 crashes in 2004. During the year following MnPASS deployment, the number of observed crashes fell to 357, a decrease of nearly 14 percent. Speed differential between the general purpose lane and the MnPASS lane was analyzed using speed data collected from the automated detectors in the corridor and revealed that the speed differential decreased in the MnPASS lane. Reduction in speed differentials generally provide a safer driving environment.

London, the United Kingdom

Transport for London (TfL) estimated that congestion pricing has an impact on the number of road traffic crashes. According to the TfL's Impacts Monitoring – Fourth Annual Report published in June 2006, there was an estimate of between 40 and 70 fewer crashes per year within the charging zone. TfL reasoned that the reduction was most likely due to traffic reduction effect of charging – fewer vehicles circulating within the charging zone translates to less possibility of crashes.

U.S. Department of Transportation

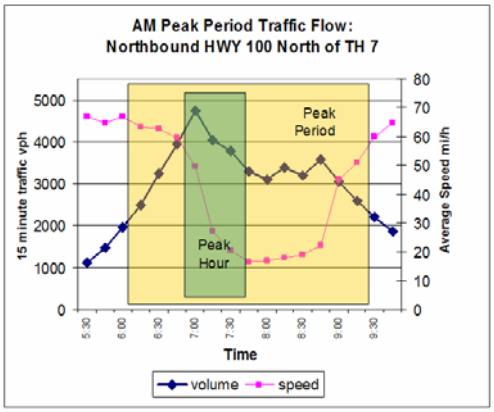
1200 New Jersey Ave., SE
Washington, DC 20590

CONGESTION PRICING: BENEFITS (TIME SAVINGS AND THROUGHPUT)

U.S. Department of Transportation

1200 New Jersey Ave., SE
Washington, DC 20590

A highway system breaks down and becomes noticeably congested when the traffic demand exceeds the capacity of the facility. There is ample evidence confirming that the vehicles served (throughput) and speeds are reduced when traffic demand exceeds the roadway capacity. The adjacent figure illustrates how the corridor reaches capacity at 7:00 AM. Shortly after 7:00 AM, the throughput of the corridor drops from a maximum of 4800 vehicles per hour (vph) to approximately 3100 vph. As a result, the facility serves 1700 less vph due to this demand to capacity relationship (i.e., breakdown). The average speed of the facility also drops to 20 mph, and the prevailing conditions remain until the commute period ends around 9:30 AM.



Efforts to assess the system-wide impacts of demand management strategies, including congestion pricing, have just begun. Currently, it is well known that demand management strategies, including congestion pricing, have the potential to influence mode choices, route choices, choices regarding departure times, and in some cases eliminating a trip all together, resulting in better use of the available capacity of the highway network. Some studies suggest that there is an increase in speeds and vehicle throughput as a result of applying these strategies, including congestion pricing.

State Route 91, Orange County, California

Limited data collected on State Route 91 shows that the priced lanes carry twice as many vehicles as the adjacent toll-free lanes during the hour with heaviest traffic. Simulation studies have also shown that congestion pricing strategies eliminate demand surges during peak periods and prevent facilities from breaking down, resulting in higher speeds and vehicle throughput.

Washington, DC Area

A simulation study in the Washington, DC area indicated that a 15% drop in demand in the morning peak, due to pricing, resulted in an increase in vehicle throughput of more than 50% on a specific freeway facility.

The ultimate benefit of congestion pricing remains unknown. This is due in part to limited empirical data on how travelers react to the choices made available to them when the strategy is implemented at a large scale. The Federal Highway Administration has begun several studies to better understand and to quantify the benefits of congestion pricing as a viable demand management strategy. One study will collect and analyze data in several locations across the country to better understand the impact of eliminating demand surges during peak periods on vehicle throughput and speed in highway networks. In addition, several simulation studies have begun to better understand the real impacts of congestion pricing on traffic operations in highway networks.

CONGESTION PRICING: EQUITY

U.S. Department of Transportation

1200 New Jersey Ave., SE
Washington, DC 20590

Studies have shown that lower income individuals face the greatest financial harm when they are denied adequate choices. For example, lack of choice can result in lost wages or late fees for day care that could have been avoided had they been provided a viable choice. Surveys conducted on priced lanes have concluded a broad spectrum of income groups express approval of the priced projects because they are given a choice of choosing a tolled route, an alternative route, or a different transportation mode. Furthermore, transit riders, many of whom are low-income users, actually experience faster and more reliable transit trips when lanes are managed with pricing.

- Data collected along facilities currently operating on major transportation corridors in California, Minneapolis and Texas show a wide range of income groups use the value priced lanes at different levels of frequency.
- Impacts of congestion pricing are not necessarily related to income and can also be based on flexibility of time and routes available to users according to research from San Jose State University and the University of California, Berkeley.
- In San Diego, support for the "FasTrak" congestion pricing program on I-15 was 60% among those with incomes less than $40,000.
- Studies on SR-91 in southern California have shown that at any given time about three-quarters of the vehicles in the toll lanes belong to low and middle income individuals with only one-quarter of the vehicles belong to high-income individuals. According to data collected on "express lanes" in California, low-income drivers are as likely to approve of the lanes as drivers with higher incomes. In fact, over half of the commuters (51%) with household incomes under $25,000 a year approved of providing toll lanes.
- A 2006 survey on the I-394 MnPass revealed MnPass usage was reported across all income levels, including 79% of higher income respondents, 70% of middle income respondents and 55% of lower-income respondents. The survey also revealed support for the lanes to be high across all income levels including 64% of lower-income respondents.
- Lower income residents are more likely to be transit riders who would benefit from both reduced congestion and increased transit investments from pricing revenues. A 2007 King County Washington survey revealed support for tolling grew substantially if a portion of revenues is dedicated to transit, even if tolls had to be significantly higher to allow such a diversion to occur.

CONGESTION PRICING: ENVIRONMENTAL BENEFITS

U.S. Department of Transportation

1200 New Jersey Ave., SE
Washington, DC 20590

Congestion pricing can improve the environment in several ways. First, it reduces vehicle miles traveled (VMT) and thereby reduces fuel consumed and pollutant emissions. Second, it reduces stop-and-go traffic, reducing fuel consumed and emissions generated by accelerations and decelerations. Third, reduced traffic in urban environments creates a more livable, pedestrian-friendly environment and reduces noise from traffic. While researchers have for decades predicted the beneficial environmental impacts of pricing, we have more recently seen evidence of these impacts in cities around the world where congestion pricing has been implemented. Responding to this evidence, two U.S. mayors have promoted congestion pricing, primarily on environmental grounds.

Evidence from operating projects

Three cities have implemented congestion pricing on a broad scale and have realized significant environmental benefits. Through cordon pricing in its central business district, London reduced emissions of particulate matter and nitrogen oxides by 12 percent and fossil fuel consumption and carbon dioxide emissions by 20 percent. Singapore's congestion pricing scheme prevents the emission of an estimated 175,000 lb of carbon dioxide each day; and Stockholm's congestion pricing system has led to a 10 to14 percent drop in carbon dioxide emissions in its central area.

Evidence from academic research

For several decades, researchers, academicians, and traffic analysts have known that traffic congestion degrades environmental quality, and that congestion pricing can help reverse the process. In a research report published in 2000, the authors of a seminal study, *The Environmental Impact of Highway Congestion Pricing*, demonstrated through modeling that congestion pricing of highways has the potential to provide important environmental benefits. Other studies have shown that reducing congestion can positively impact public health. One such example comes from a study of Atlanta, GA, during the 1996 Summer Olympics. Several travel demand management measures were introduced to reduce traffic congestion during the 17 days of the games. The study found that daily peak ozone levels dropped 28 percent and hospitalizations for asthma fell by almost 20 percent during that time.

Political support

Two major U.S. cities have recently championed pricing on environmental grounds. New York City plans implementation of congestion pricing in Manhattan by the spring of 2009. The plan was introduced in April 2007 by Mayor Bloomberg as a center piece of the city's long-term environmental sustainability plan. During his recent second term inauguration, San Francisco Mayor Gavin Newsom stated: "A sensible congestion-pricing plan is the single greatest step we can take to protect [San Francisco's] environment and improve our quality of life."

CONGESTION PRICING: PUBLIC PRIVATE PARTNERSHIP

U.S. Department of Transportation

1200 New Jersey Ave., SE
Washington, DC 20590

DOT believes that PPPs are integral to the long-term re-thinking of how the United States provides highway and transit infrastructure. Unlike traditional approaches to funding and procurement, which do little or nothing to address increasingly evident policy failures, PPPs offer an innovative alternative that responds to the failures of status quo approaches:

Chronic undercapitalization: Since PPPs are long-term investments, investors are more likely than governments (who are subject to annual budgetary pressures) to sufficiently capitalize a transportation asset up front in order to reduce operating and maintenance costs over the life of the asset.

Congestion/declining system reliability: Private operators have strong incentives to ensure high levels of throughput (and speed), because more vehicles equals greater investment returns.

Misallocation of investment resources: Private investment is research-based and follows demand, not political influence.

Accountability to the user: Private infrastructure providers typically provide higher levels of customer service.

Accountability to the taxpayer: Users pay directly for the benefits they receive and subsidies are transparent and justified.

Faster project delivery: Investors cannot afford to have capital tied up indefinitely so construction and design delays are avoided.

Need for system expansion and reconstruction: An increasing portion of state transportation dollars support preservation and maintenance of the existing system, leaving an unfilled gap to expand or reconstruct.

The private sector designs and constructs the vast majority of surface transportation projects in the United States today. The question is whether PPPs can successfully transfer risks from the taxpayer to the private sector more comprehensively than can be done through traditional procurement. State and local authorities are enthusiastic about PPPs because they reduce costs, accelerate project delivery, transfer project risks to the private sector (including design, construction, financing, operation, and maintenance risks) and provide innovative and high-quality projects. Projects that can't be done using traditional approaches to funding and procurement may be viable as PPPs.

Since 2004, more PPPs for surface transportation facilities have reached commercial and financial close than during any comparable period in U.S. history. These projects include long-term concessions to operate and maintain existing toll facilities, and long-term concessions to design, build, finance, operate and maintain new capacity or capital improvements. There are more than 20 major PPP projects currently at various stages of procurement in the United States.

Congress and DOT have undertaken a number of initiatives to increase the role of the private sector in highway and transit projects, including the establishment of the Private Activity Bonds program for highways and freight facilities, the TIFIA program (which was updated in 2005), Interstate Tolling programs, the SEP-15 program, and FTA's Public-Private Partnership Pilot Program.

While there are risks in PPPs, including risks of monopoly pricing, corruption, institutional inexperience, lack of sufficient competition, and others, these risks are manageable and can be mitigated by creating well-balanced PPP programs, performing rigorous due diligence before committing to projects, and carefully negotiating concession agreements. Best practices will continue to be developed as more and more PPPs are procured and State and local jurisdictions explore and implement innovative solutions that manage these risks.

CONGESTION PRICING: LEVERAGING

U.S. Department of Transportation

1200 New Jersey Ave., SE
Washington, DC 20590

DOT believes that using innovative financing strategies to leverage limited public transportation revenue is integral to the long-term re-thinking of how the United States provides highway and transit infrastructure. While motor fuel taxes and vehicle fees do little or nothing to address the underlying problems that contribute to State and local transportation funding shortfalls, such as congestion and misallocation of resources, innovative financing strategies encourage State and local authorities to leverage traditional sources of transportation revenue to attract private capital and reduce State and local reliance on Federal grants and gas taxes.

- In December 2007, the Virginia DOT reached commercial and financial close on the Capital Beltways HOT Lanes Project, a dynamic solution to traffic on one of the most congested corridors in the country. For this project, approximately $409 million from Federal-aid and State sources is being leveraged to attract approximately $1.3 billion of additional capital, including a $588 million loan from DOT's TIFIA program, DOT authorization for the issuance of up to $800 million in private activity bonds to be repaid by the private sector concessionaire, and private equity contributions totaling $350 million from the members of the concessionaire.

- Private equity firms have raised billions of dollars for investment in transportation projects, primarily in stable western countries like the United States. CalPERS, the largest public pension fund in the United States, recently approved a $2.5 billion pilot infrastructure investment program. *The Financial Times* reported on December 30, 2007, that "estimates of equity already raised for infrastructure investment but not yet invested range from $50 billion to $150 billion." Leveraging traditional sources of transportation revenue to attract private capital and financing provides access to vast amounts of capital for investment in transportation projects.

- State and local authorities are enthusiastic about innovative financing strategies, including public-private partnerships (PPPs), tolling and pricing. These strategies can reduce costs, accelerate project delivery, transfer project risks to the private sector (including design, construction, financing, operation, and maintenance risks) and provide innovative and high-quality projects. These strategies also enable the public sector to manage congestion and generate revenue. Projects that can't be done using traditional approaches to funding may be viable using innovative strategies because their projected revenue streams are financeable.

- Congress and DOT have undertaken a number of initiatives to encourage State and local jurisdictions to leverage scarce public resources for highway and transit projects. These initiatives include the Private Activity Bonds program which allows private developers to utilize tax-exempt debt to finance transportation projects, and the TIFIA program (which was updated in 2005), which provides flexible, subordinate credit assistance to facilitate the financing of transportation projects. Interstate Tolling programs, the SEP-15 program, and FTA's Public-Private Partnership Pilot Program also encourage greater use of financing.

- Before increasing gas taxes or other traditional sources of transportation revenue, States and local jurisdictions should consider the benefits of using innovative financing strategies to leverage limited public transportation revenue and attract private capital.

CONGESTION PRICING: EXAMPLES AROUND THE U.S.

U.S. Department of Transportation

1200 New Jersey Ave., SE
Washington, DC 20590

There are three main types of pricing strategies that have been implemented or are being considered for implementation in the United States:

- ***Variably priced lanes***, involving variable tolls on separated lanes within a highway, such as Express Toll Lanes or High Occupancy Toll lanes, i.e. HOT lanes. Express Toll lanes are currently operating in Orange County, California. HOT lanes are operating in San Diego, Minneapolis, Denver, Houston and Salt Lake City.
- ***Variable pricing on entire facilities***, which have been implemented on toll roads and bridges.
- ***Cordon charges*** to drive within or into a congested area. Such charges are under consideration for the central business district in New York City.

Variably priced lanes

I-15 in San Diego: Since 1998, single-occupant vehicles pay a per-trip fee each time they use the I-15 High-Occupancy Vehicle (HOV) lanes. The lanes are called High-occupancy Toll or HOT lanes. Tolls vary "dynamically" (i.e., in real time) with the level of traffic demand on the lanes. Fees may rise or fall in 25-cent increments as often as every six minutes to help maintain free-flow traffic conditions on the HOV lanes. The project has generated $7 million in revenue since 1998. About one-half of this revenue has been used to support transit service in the corridor. The number of carpools increased by 50 percent between 1998 and 2006. I-15 commuters, including HOT lane users, carpoolers, and general purpose lane commuters, overwhelmingly support the HOT lanes.

Variable Pricing on Entire Facilities

Lee County, Florida**:** Variable pricing began August 3, 1998, on the Midpoint and Cape Coral toll bridges in Lee County, Florida. Bridge travelers were offered a 50 percent discount on their toll if they traveled during specific discount periods and paid their toll electronically. The discount periods are 6:30 to 7 am, 9 to 11 am, 2 to 4 pm, and 6:30 to 7 pm. This toll structure was developed to encourage drivers to shift from peak periods to off-peak/discount periods.

Cordon Pricing

New York City: New York City is the first city in the United States to propose charging all motorists for driving in its congested core. Mayor Bloomberg's plan is projected to lead to a 6.7% reduction in vehicle miles traveled (VMT) below 86th Street in Manhattan. A flat $8 daily fee will be charged to passenger vehicles and $21 daily to trucks from 6 am to 6 pm on weekdays. Improvements will be made to transit service to support the expected increase in transit ridership. Net annual revenues of almost $500 million will be invested in transit.

CONGESTION PRICING: EXAMPLES AROUND THE WORLD

Several cities in Europe have implemented congestion pricing in their central business districts to combat traffic congestion and air pollution, including London, Stockholm, Malta, Rome, and Milan. This brief highlights the London and Stockholm schemes, as well as a more comprehensive approach involving pricing of the expressway system and major arterials in Singapore.

London

On February 17, 2003, London implemented congestion pricing in central London. The scheme involves a standard per-day charge for vehicles traveling within a zone bounded by an inner ring road. Motorists are currently charged £8 (US $16) a day to drive within the central city zone between 7 am and 6:30 pm on weekdays. The congestion charge, together with improvements in public transit financed with revenues from the charging system, led to a 15 percent reduction in traffic in central London, and a 30 percent reduction in travel delays. There was no significant diversion of traffic to local roads outside the area. The majority of former car users transferred to public transport. Delay time for bus riders fell by around one-third due to faster speeds and more frequent service.

Stockholm

Stockholm deployed cordon pricing similar to London's in its central business district on a trial basis from January 2006 to July 2006. Although there was majority opposition prior to the trial, public acceptance climbed throughout the trial, from under 30 percent approval before the trial to over 55 percent towards the end. There was a 20-25 percent reduction in traffic volumes on most congested roads, a 14 percent drop in vehicle miles traveled within the cordon, and a 1 percent reduction outside. This led to a decrease in travel times, more reliable travel times, and a 4.5 percent increase in use of public transit. Exhaust emissions decreased by 14 percent in the inner-city and 2 to 3 percent in Stockholm County. Residents of the City of Stockholm voted for continuation of the system in a referendum and the scheme was permanently reinstated in August 2007.

Singapore

Traffic congestion was significantly reduced when peak-period pricing was introduced in downtown Singapore during the morning rush hours in 1975. In spring 1998, the city shifted to a fully automated electronic charging system. Variable electronic charges were also introduced on the expressway system, with charges set by time of day to ensure free flow of traffic. The system, the first of its kind in the world, has reduced traffic by 13 percent and increased vehicle speed by 22 percent.

U.S. Department of Transportation

1200 New Jersey Ave., SE
Washington, DC 20590