VALUE PRICING PILOT PROGRAM

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With the costs of traffic congestion escalating in cities and suburbs across the United States and around the world, a new concept, long confined to the chalkboards of academic institutions, is finally emerging as a real-world tool for enhancing urban mobility. This concept, known as value pricing or congestion pricing, provides a way of harnessing the power of the market to reduce the waste associated with traffic congestion, a waste that places substantial burdens on individuals, families, businesses, and the nation. In its annual survey of congestion trends, the Texas Transportation Institute estimated that in 1996, the cost of traffic congestion (in terms of delay and wasted fuel) amounted to $74 billion per year in 70 major urban areas (*1*). Average congestion costs per driver were estimated at $333 per year in small urban areas and $936 per year in very large urban areas. And these costs may be just the tip of the iceberg when one considers the cost of economic dislocation and lost productivity due to mispricing of the nation's roads.

Typically, the problem of congestion is not strictly a problem of lack of road capacity. Rather, road congestion is evidence of too many travelers wanting to use the same space at the same time. As with other goods and services, if a market-clearing price is not charged, travelers are eager to get a share of the underpriced good. In other sectors of the economy in which demand varies by time of day, season, or location, market pricing has been used to ration the use of fixed facilities that are subject to congestion. Airlines offer off-peak discounts, hotel rooms cost more during peak tourist seasons, and public utilities have peak/off-peak pricing plans.

Value pricing applies these same principles to the problem of traffic congestion, recognizing that trips occasion varying costs and have differing values at different times and places and for different individuals. Using price to allocate space on congested road facilities entails charging relatively higher prices for travel during periods of peak demand than for trips made during other periods. Faced with these

Goal of value pricing is to reduce traffic congestion by encouraging people to travel during off-peak periods, choose alternative routes or modes, or eliminate trips.

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Under FasTrak™, solo drivers in San Diego pay a per-trip fee, varying from $.50 to $4.00, to use I-15 HOV lanes. Fees are based on traffic levels in high-occupancy-vehicle lanes and time of day, and change with level of congestion.

premium charges, travelers may be encouraged to travel at different times, to choose alternative routes or modes, or to eliminate some lower-valued trips. Prices therefore offer incentives for more efficient use of existing highway capacity, and they also provide important signals about the need for additions of new capacity (i.e., when congestion charges rise above the cost of adding a unit of new capacity). Value pricing, then, is aimed at improving service to transportation users, making more productive use of existing transportation capacity, and reducing the need for future capacity expansion.

To encourage the testing and evaluation of value or congestion pricing concepts in a variety of settings nationwide, the Intermodal Surface Transportation Efficiency Act of 1991 authorized the Congestion Pricing Pilot Program. This program was designed to provide federal support for efforts by state and local governments or other public authorities to establish local road pricing programs; to provide for implementation, monitoring, and evaluation of road pricing projects; and to disseminate information on the effects of those projects. Following the positive experience under the ISTEA legislation (2), this innovative program was reauthorized and expanded as the Value Pricing Pilot Program under the Transportation Equity Act for the 21st Century.[1]

The Federal Highway Administration and its project partners have now had more than 7 years of experience with the pilot program. Ten projects have been funded, and more than $30 million in federal funds has been provided to support these projects. The activity of these pilot projects and the overwhelmingly positive response to FHWA's series of regional workshops on value pricing have stimulated active interest in the concept in several cities. Potential new applications of value pricing are now being explored in a number of locations, and new pilot project agreements are expected in the coming months.

The ultimate test of the pilot program's success will be, of course, the extent to which the projects supported with program funds move into the operational phase. In this regard, some exciting accomplishments are emerging. Operational projects are being supported in San Diego, California; Houston, Texas; and Lee County, Florida. In addition, program funds are being used to support a monitoring and evaluation study of priced express lanes on State Route 91 in Orange County, California. These projects are now providing some early results.

Dynamic Pricing in San Diego

San Diego's Value Pricing Project on Interstate 15 (I-15) is a 3-year demonstration that allows single-occupant vehicles (SOVs) to use the existing high-occupancy-vehicle (HOV) lanes for a fee. Begun in December 1996, the project is managed by the San Diego Association of Governments in cooperation with the California Department of Transportation (Caltrans) and FHWA. The intent of the project is to improve transportation service on I-15 and generate revenue for transit service improvements in the I-15 corridor.

The project consists of two phases. During the first phase, called I-15 ExpressPass, SOV customers paid a flat monthly fee for unlimited use of the HOV lanes. For the first 6 months, program participants received colored, windshield-mounted permits, which were replaced by transponders in June 1997. When the ExpressPass program began in December 1996, 500 permits were sold for $50.00 each. This initial issuance did not meet the demand for permits; however, the number of permits had to be limited to ensure that the level of service on the HOV lanes would not be degraded. During the 16 months of the ExpressPass program, the number of monthly permits was increased incrementally. By the last month (March 1998), 1,000 permits costing $70.00 each had been made available.

The next 21-month phase of the pricing program, called I-15 FasTrak™, was then initiated. Under FasTrak, SOV customers pay a per-trip fee each time they use the I-15 HOV lanes. The fee typically varies from $.50 to $4.00, and is based on traffic levels in

[1] The change in terminology from "congestion" to "value" pricing follows the practice of many of the Federal Highway Administration's state and local partners, which have elected to use the latter term to emphasize the potential benefits of this form of road pricing.

the HOV lanes and time of day. FasTrak toll collection is conducted electronically by means of transponders and overhead antennas. The unique feature of this phase of the program is that fees change dynamically with the level of congestion, varying in increments of $.25 as often as every 6 minutes to help maintain free-flowing traffic conditions.

A comprehensive monitoring and evaluation effort is under way to assess the project's impacts on traffic and speeds, modal usage, operational issues, costs, revenues, acceptance, and business activity. Now in its third year of operation, the I-15 Value Pricing Project has been successful in meeting its primary goals of maximizing the use of the excess capacity on the I-15 HOV lanes and improving transit services along the I-15 corridor.

Improved Use of Existing Capacity

Traffic on the I-15 HOV lanes has increased substantially since the inception of the pricing project:

- The total number of vehicles using the HOV lanes increased by 46 percent from October 1996 (preproject) to April 1999 (from 9,215 to 13,477 average daily vehicles).
- In the peak morning hour, the two-lane HOV facility was carrying 2,300 to 2,400 vehicles per hour at free-flow speeds in late April 1999, compared with 1,600 vehicles per hour in October 1996.
- Most of the increase in traffic on the HOV lanes is attributable to the use of carpools, which rose by 30 percent from October 1996 to April 1999 (from 7,685 to 9,970 average daily HOVs). Carpools increased primarily in the ExpressPass phase and peaked during the first month of FasTrak (April 1998) at about 10,546 average daily HOVs; from April 1998 to April 1999, carpools declined by approximately 5 percent.

The increased use of HOVs is under further investigation. A possible reason for the increase is that pricing provides more direct evidence of the cost savings from carpooling, since carpools use the express lanes without charge, while solo drivers must pay a fee. Another possible reason is that increased enforcement by the California Highway Patrol, funded by the project, encourages solo-driver violators to become carpoolers. It has also been speculated that pricing allows more flexible carpooling arrangements. People are more willing to commit to becoming carpool members because they know the same time savings will be available, for a fee, on days when carpool members are not traveling. The ongoing evaluation of the changes in HOV usage will help clarify these possibilities.

In April 1999, FasTrak trips comprised 22 percent (2,968 of 13,477) of total average daily trips on the HOV lanes. Although the percentage of FasTrak usage has been increasing with the distribution of transponders, fewer than 10 percent of FasTrak customers use their FasTrak account on a daily basis.

One of the program benefits has been the significant reduction in solo-driver violators on the I-15 HOV lanes, a result of the increased California Highway Patrol enforcement. In October 1996, illegal SOVs comprised 17 percent of total vehicles on the HOV lanes. Throughout the ExpressPass and FasTrak program phases, violation rates have ranged between 3 and 5 percent of total traffic. (Typical HOV lane violation rates throughout California range from 5 to 10 percent.)

New I-15 Transit Service

The revenue raised by the ExpressPass/FasTrak program supports a new express bus service in the I-15 corridor, called the Inland Breeze. This service, which began in November 1997, uses the I-15 HOV lanes in peak periods and the mixed-flow lanes during off-peak hours. The service connects with San Diego's light rail trolley system. The Inland Breeze operates every 30 minutes during the morning and afternoon peak periods. Ridership averaged 525 daily passengers in April 1999, short of the goal of 750 riders per day. Two-thirds of peak ridership on the Inland Breeze is in the reverse-commute direction. The new route has provided faster service for existing transit riders, but has not attracted peak-period I-15 main-lane users traveling in the peak direction. At the request of the San Diego Association of Governments, the local transit agency is currently evaluating the Inland Breeze operation, and service adjustments are likely.

Success with Customers

Customers view the I-15 pricing project as a success. In surveys conducted in spring 1998, 79 percent of FasTrak customers said they considered the program successful. By the fall 1998 survey, this figure had increased to 89 percent. Customers cite travel time savings of 10 to 20 minutes, free-flow traffic conditions in the HOV lanes, and the reliability of on-time arrival as program benefits. Response to the dynamic pricing phase of the program has been highly positive.

Variable Bridge Tolls in Lee County, Florida

In August 1998, Lee County, Florida, in cooperation with the Florida Department of Transportation and FHWA, implemented value pricing on two toll bridges—the Cape Coral and Midpoint Memorial Bridges (see Figure 1). Commuters in the county use both bridges heavily, at an average weekday volume of 60,000 to 65,000 vehicles. The implementation of

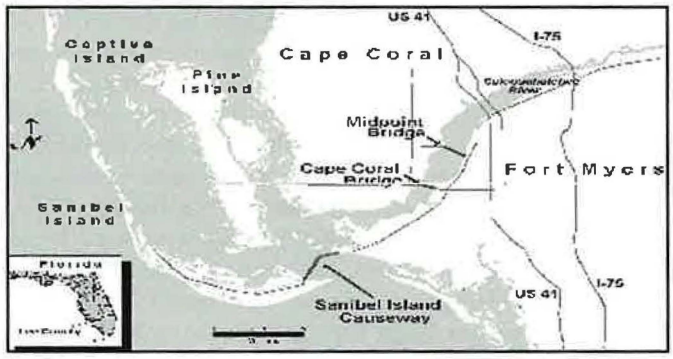


FIGURE 1 Variable tolls were implemented on Midpoint Memorial and Cape Coral Bridges in Lee County, Florida, to encourage travel during off-peak periods.

pricing strategies on these facilities could be expected to affect a large portion of the county's roadway network, since changes in traffic patterns on these bridges should be reflected on numerous other facilities as well.

The Lee County variable pricing program offers bridge patrons a discount toll during selected off-peak hours as an incentive to change trip times from peak to off-peak hours. Currently the program is limited to two-axle vehicles. The nominal toll is $1.00 for each one-way bridge crossing; however, patrons have several discount options, including one that allows them to purchase an annual pass that reduces the toll for each crossing to $.50. The time-of-day discount was therefore implemented as a 50 percent reduction in the normal toll for trips made during selected off-peak hours. The hours were selected as those most likely to attract trips outside the peak hours. The discount is also limited to those patrons who pay electronically using a transponder.

To obtain a preliminary indication of the effect of the new toll policy on traffic behavior, traffic data for January to July 1998 (before variable pricing began) were compared with traffic data for August to December 1998 (with variable pricing operational).[2] This method is not ideal because of potential seasonal traffic fluctuations. Fortunately, both the Midpoint Memorial and Cape Coral Bridges are primarily commuter bridges and are not heavily affected by seasonal traffic variations. In addition, travel patterns of patrons eligible to receive variable pricing discount tolls (those with a transponder) were examined separately from the patterns of ineligible patrons. The change in traffic patterns among ineligible patrons provides a baseline against which to compare any changes in traffic patterns among eligible patrons.

The comparison revealed that while little change had occurred among ineligible patrons, there had been a significant shift toward travel outside of peak periods on both bridges among those eligible for the variable discount tolls. There had been a significant increase in traffic during most half-hour time periods in off-peak hours, whereas traffic had decreased significantly during peak periods (see Figures 2 and 3). (Changes of more than approximately 2 percent are statistically significant at the 95 percent confidence level.)

These changes in traffic patterns show clearly that drivers are altering their travel behavior in response to variable pricing. Because less than 25 percent of the traffic stream is currently eligible for variable pricing, the raw number of vehicles altering their travel times is not as dramatic as the percentages shown in Figures 2 and 3. However, the impact of variable pricing is expected to increase as the number of eligible patrons grows. Overall, the data indicate that bridge travelers are responding to variable pricing as predicted, shifting their travel times from peak to discount (off-peak) periods. The data show statistically significant changes during most of the time periods. These data will be updated as the project continues, and will be supplemented with travel survey data to determine why people have altered their travel times and to identify the socioeconomic characteristics of this group of bridge users.

Houston's QuickRide Program

Travelers in the Katy Freeway (I-10) corridor in Houston are being offered an opportunity to improve their peak-hour commutes through pricing. The Katy Freeway HOV lane, usually restricted

[2] The data examined are the average traffic flows during each half-hour period of the day. All Saturdays, Sundays, and certain holidays (New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving, and Christmas) were excluded from the data, as variable pricing discounts are not offered on these days. The week of September 21 was also excluded because of the abnormal traffic patterns caused by Hurricane Georges. The average daily traffic was calculated for the periods before and during variable pricing. Average daily traffic was higher for the portion of the year in which variable pricing was in effect. To compensate, each half-hour total in the portion of the year before variable pricing was increased by the same percentage so that average daily traffic was equal in both portions of the year.

during peak hours to buses and carpools with three or more people, is now available to two-person carpools that register for the QuickRide program and pay a $2.00 fee for each trip. The program is sponsored jointly by the Metropolitan Transit Authority of Harris County (METRO) and the Texas Department of Transportation (TxDOT).

Background

The Katy Freeway HOV lane, opened in 1984, is a 21-kilometer (13-mile), single reversible lane with three intermediate access points. The lane was quickly successful in attracting both bus patrons and carpools, so much so that by 1988 it was becoming congested and slow-moving during peak hours. Maintaining a significant speed advantage is key in encouraging people to use such a facility. Therefore, METRO and TxDOT decided at that time to reduce traffic in the lane by restricting peak-hour use to vehicles with three or more occupants. The change was effective, reducing the number of vehicles by more than half and restoring speeds to the speed limit. Today peak-hour travelers using the HOV lane save an average of 18 minutes as compared with those using the freeway's main lanes.

Improved Use of HOV Lane Capacity

Despite some increases in the number of bus patrons and carpools with three or more passengers, the 1988 elimination of two-person carpools resulted in

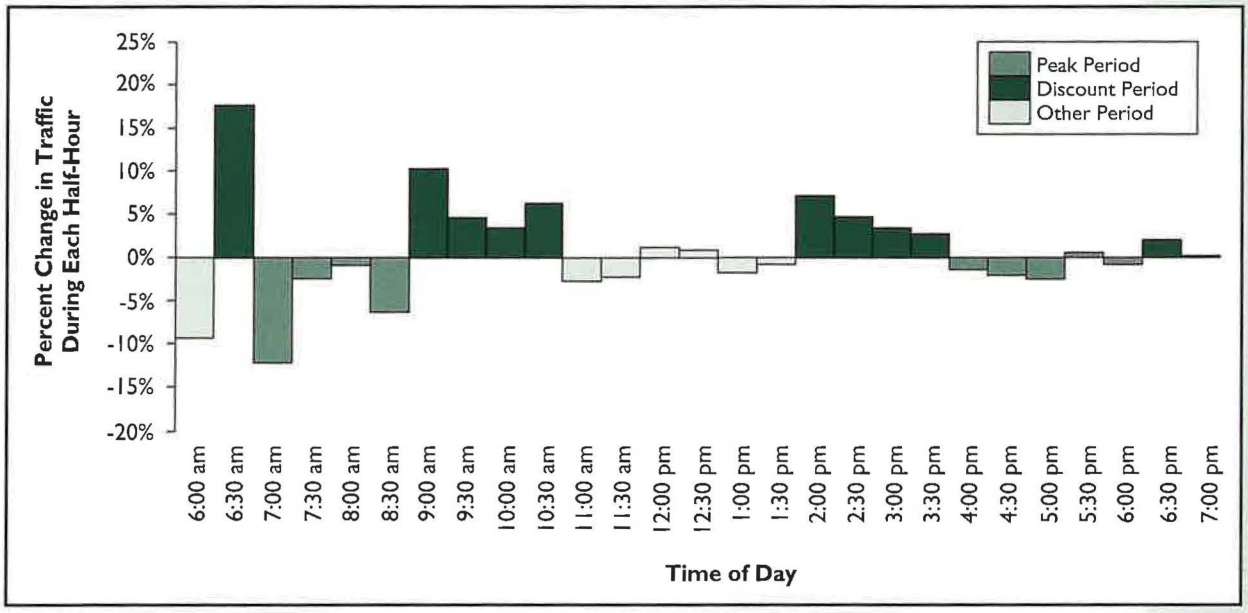


FIGURE 2
Changes in traffic volume among users eligible for variable tolls on Cape Coral Bridge, Lee County, Florida.

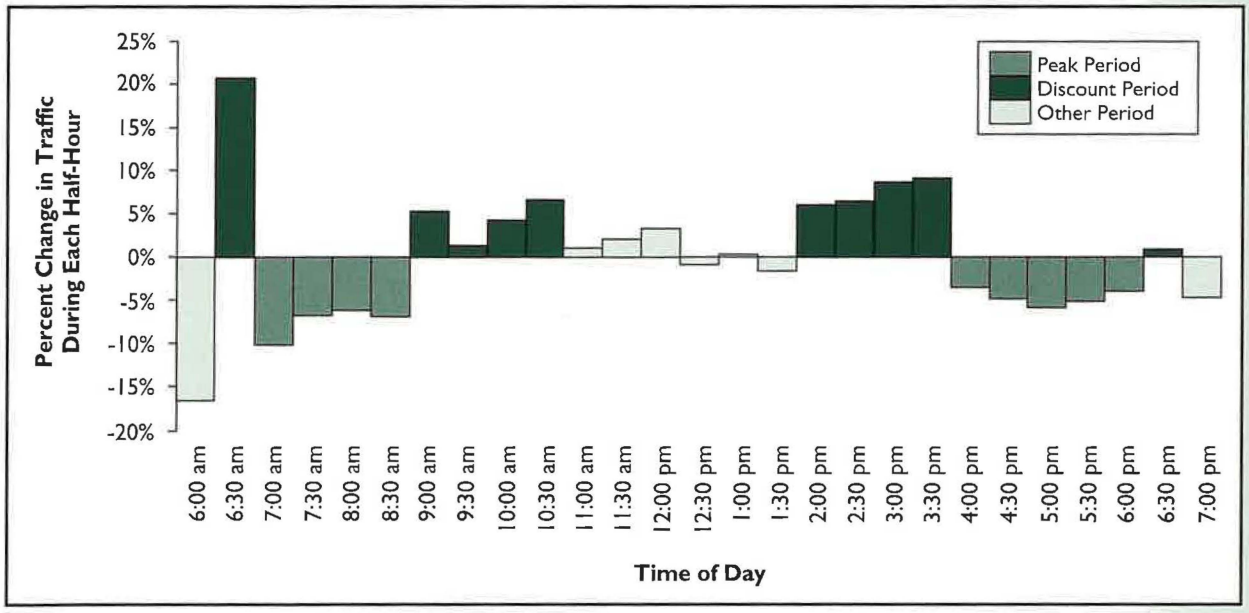
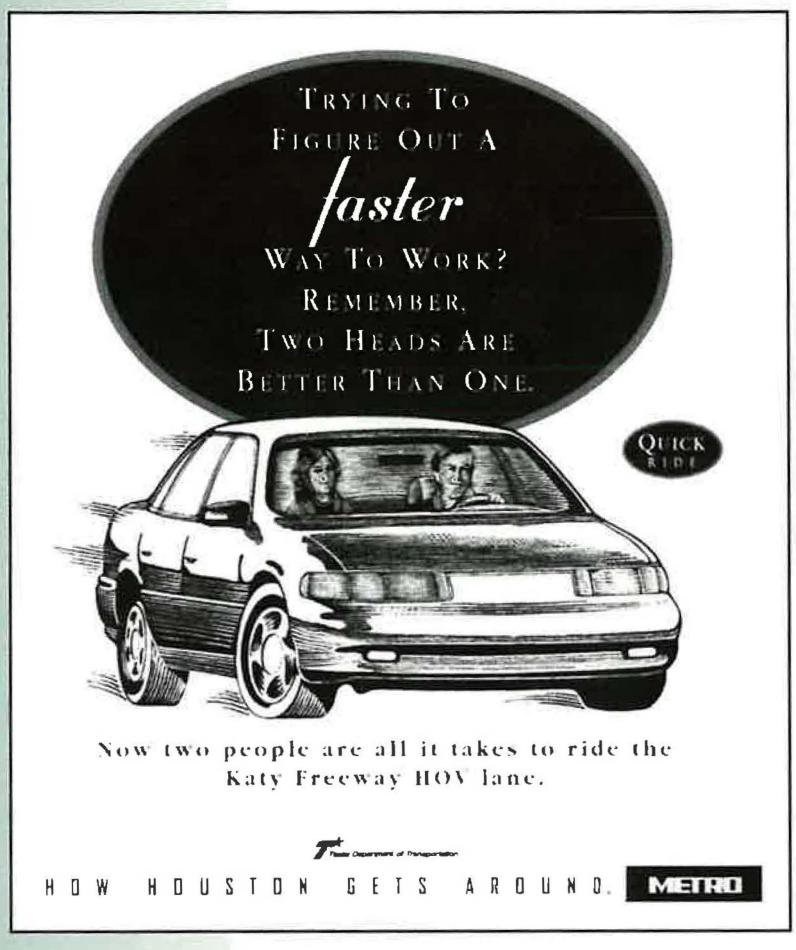


FIGURE 3
Changes in traffic volume among users eligible for variable tolls on Midpoint Memorial Bridge, Lee County, Florida.



Houston's QuickRide Program allows registered two-person carpools to pay $2.00 fee per trip to use Katy Freeway (I-10) HOV lane during peak hours.

a net loss of about 30 percent of the number of people typically moved during peak hours. A return to permitting peak-hour two-person carpools would only have reintroduced congestion in the lane. Thus there appeared to be little that METRO and TxDOT could do to improve utilization of the facility. The recent emergence of electronic toll collection technologies, combined with the introduction of federal support for pricing trials under ISTEA, offered a potential solution.

A value pricing program called QuickRide was instituted to open up the underutilized Katy HOV lane to a limited number of two-person carpools during peak hours. The goals of the program were to increase the number of people moved and average vehicle occupancy without adversely affecting HOV lane and freeway operations.

QuickRide allows two-person carpools to pay for use of the HOV lane during peak hours (6:45–8:00 A.M. and 5:00–6:00 P.M.). HOVs with three or more occupants are still permitted to use the facility for free as they could before, and two-person carpools may use the lane without charge at any time other than peak hours. SOVs are not allowed on the lane at any time. To ensure that travel conditions will remain optimal for all HOVs, the target maximum number of QuickRide vehicles is 600 during each peak hour.

The program was started at a relatively low cost, largely because existing resources could be utilized inexpensively. For example, enforcement of the pricing feature is economical because METRO Police are already present at HOV exit locations. Telephone inquiries from prospective enrollees are handled by existing staff at METRO's regional carpool matching office. And no new toll collection equipment was needed in the field because transponder readers (used to collect data for an Internet freeway speed map) were already in place.

Experience to Date

QuickRide was advertised to the public at the end of December 1997 and initiated in January 1998. A little more than a year later, some 650 transponders had been issued or registered. Daily use by participants has ranged from 150 to 200 vehicles for both peak periods combined. The vast majority of enrollees are occasional users of QuickRide. About 1 in 4 transponders is used in a given week, and about 1 in 20 transponders is used five or more times per week. Although enrollment and utilization numbers are below initial expectations, the program will continue. Factors that led to this decision include the following:

- *Improvements in occupancy*—With HOV utilization having increased during peak hours, albeit modestly, QuickRide's primary goals of increasing the number of people moved and average vehicle occupancy have been met.
- *Sources of HOV-2s*—Surveys indicate that the primary source of QuickRide participants is persons who formerly traveled in SOVs on the freeway's main lanes. Among participants, the reported number of trips made alone had been halved, while the number of carpool trips had doubled.
- *Financial viability*—QuickRide is covering the nominal operating costs associated with maintaining and servicing participant accounts (approximately $100,000 per year). This financial evaluation excludes the capital, marketing, and startup costs covered by the FHWA value pricing grant, as well as enforcement and enrollment services already in place as part of other METRO programs.
- *Public acceptance*—Participants are satisfied with the program, reporting that they enjoy the flexibility provided by QuickRide.

The Houston experience offers several lessons that could be of value to other cities or states considering pricing as an option. First, pricing concepts need not be oriented only toward the SOV market. In the right circumstances, a pricing component for an

all-HOV facility can serve to balance supply, demand, and congestion levels on that facility. Second, opportunities to leverage costs should be explored as a concept is developed. Startup costs in Houston were much lower than they would have been had existing systems not been in place. Finally, the challenges of forecasting the market accurately are substantial. The reality of working in a relatively new field is that few operational details can be predicted with certainty. In such situations, a flexible approach that emphasizes both tangible and intangible benefits to the traveling public is preferable to following a strict approach based on costs, forecast vehicle counts, and expected revenue.

Express Lane Pricing on California's State Route 91

The express lanes on California's State Route 91 (SR 91) opened in December 1995 as a buffer-separated toll facility in the median of a heavily congested 16-kilometer (10-mile) section of urban commuter freeway connecting Anaheim and Riverside County. Tolls on the express lanes vary from $.75 to $3.50 in accordance with a complex daily schedule that reflects the amount of congestion delay avoided on the parallel, nontolled freeway and the need to keep the express lanes operating at an acceptable level of service. Since opening day, the basic time-dependent toll structure has increased four times in response to increasing traffic. In January 1998, HOVs with three or more occupants (HOV-3+), which had paid no tolls since opening day, began to pay 50 percent of the basic toll. With the exception of HOV-3+ users, the toll is the same for all vehicle types. (Heavy vehicles are not permitted in the express lanes.) Toll collection is done entirely by FasTrak electronic transponders (similar to those used for San Diego's pilot project), which meet the California standard for interoperability with electronic tolling systems statewide.

Privately Financed and Operated Toll Facility

The SR 91 express lanes, a $126 million investment, represent the first of four private-enterprise transportation infrastructure projects authorized by 1989 California legislation. The four-lane toll highway, separated from the freeway lanes by a painted buffer and plastic pylons, is operated by the California Private Transportation Company (CPTC) under a 35-year franchise agreement with the state. CPTC is a limited partnership formed by subsidiaries of Peter Kiewit Sons', Inc.; Cofiroute Corporation; and Granite Construction Company. In its 1998 annual report, CPTC announced annual revenues of $20.12 million from about 9.27 million vehicle-trips. These revenues covered operating expenses of $8.7 million and contributed $11.4 million to debt service.

The California Highway Patrol is responsible for law enforcement on the express lanes, and maintenance is performed by Caltrans. Both state agencies are compensated for these services from toll lane revenues. Violators are identified through photographic methods. If not stopped on site, they receive by mail a notice to pay and, if necessary, a subsequent citation. CPTC runs its own motorist assistance program and operates its own state-of-the-art traffic management center, linked electronically to the Caltrans regional traffic management center.

The SR 91 express lanes are currently the only privately operated toll facility in California. However, a nearby network of public toll highways is nearing completion under the management of the Orange County Transportation Corridor Agencies. In October 1998, a major segment of the public toll road network (the Eastern Toll Road) opened in direct competition with the SR 91 express lanes. Unlike the SR 91 express lanes, the Eastern Toll Road charges a fixed toll regardless of prevailing congestion.

Initial Observations

Because the SR 91 express lanes provide a valuable opportunity to learn more about how travelers and travel conditions are affected by time-of-day road pricing, Caltrans and the FHWA Value Pricing Pilot Program are sponsoring a multiyear monitoring and evaluation study, conducted by California Polytechnic State University, San Luis Obispo. A wide range of impact data—including data on traffic volume, speed and occupancy, origins–destinations, public opinion, accidents, and ridership on parallel public transit lines—is being obtained and analyzed. A final report covering prior conditions and the first 18 months of express lane operation was published in 1998, and further investigation of changes occurring since that time is currently under way.

The initial study of the operation of the express lanes yielded a number of important observations:

- Traffic on the express lanes continued to increase steadily through the first 3 years of operation. During this period of traffic growth, price changes were successful in maintaining the free flow of peak-hour traffic.
- Travelers display considerable selectivity in deciding when and under what circumstances to use the express lanes. Half the customers use the lanes once a week or less. The hour-by-hour proportions of traffic choosing to use the express lanes closely parallel the amount of delay avoided.

◆ Frequency of express lane use is correlated with income. Among the lowest-income group identified in the study, however, 25 percent are frequent express lane users. Moreover, female commuters are significantly more likely than male commuters to be frequent express lane users.

◆ About 75 percent of the commuting public expressed approval of virtually all aspects of the express lanes after 18 months of operation. Approval of variable tolls and private-sector involvement was initially lower, but increased after about a year of experience with the program.

In all, the express lanes constructed on SR 91 have demonstrated that new highway travel options—in this case, premium service for a premium price—can win public acceptance and result in significant travel changes. In many urban highway corridors, limited options are available to those whose trip requirements or personal situations warrant paying extra to better meet their travel requirements. The approach of providing additional choices through pricing appears to be working well in its first major American implementation in California.

Websites for Value Pricing Studies

San Diego's FasTrak™:
www.sandag.cog.ca.us/

Variable bridge tolls in Lee County, Florida:
www.LeeWayInfo.com or
www.cutr.eng.usf.edu/its/varprice.htm

Houston's QuickRide:
www.hou-metro.harris.tx.us/KATY.HTM

Express lane pricing on California's State Route 91:
http://airship.calpoly.edu/sr91/sr91.htm

Conclusions

Value pricing is becoming an important element of transportation policy in the United States. Projects conducted to date are breaking new ground and providing important lessons for those interested in exploring the use of pricing as a tool for enhancing urban mobility. The U.S. interest in pricing is mirrored by active interest among other countries in North America, Europe, and Asia, where value pricing is either in use or under intensive study. The early results from projects conducted to date reveal that travelers are willing to pay for improvements in transportation service and that pricing can lead to more efficient use of existing highway capacity. People respond to price signals when making transportation decisions, just as they do in other aspects of their economic lives, and those responses can serve as important guides for transportation planners and policy makers.

Further progress in implementing value pricing is expected in coming years, driven by the need to find new solutions to growing congestion problems, as well as advances in tolling and vehicle identification technologies and the search for additional revenues to finance needed transportation improvements. The true promise of these projects is that greater use of market pricing principles in highway transportation can help rationalize transportation investment decisions and lead to significant reductions in the economic waste associated with traffic congestion. Whether these early pilot demonstrations will help lay the groundwork for more comprehensive applications of value pricing in the United States, with congestion surcharges applied across an entire congested highway facility or network of congested facilities, has yet to be seen. But in the words of 1996 Nobel laureate in economics William Vickrey, "...once a start has been achieved, who knows how much further one will be able to go?" (3).

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