The Case for Two-Tier Congestion Pricing on Urban Tollways

By Robert W. Poole, Jr.

As observers of our industry know, congestion pricing has become one of the hottest ideas in urban transportation over the past several years. The basis of the concept is that demand for mobility is affected by the price charged to use a roadway facility. Hence, at times and places where demand exceeds supply, or capacity, pricing should be an effective tool for reducing peak demand and, therein, congestion. Indeed, the well-known examples of Singapore and, more recently, central London and Stockholm support this theory.

In the United States, the only form of congestion pricing that has been implemented to date is high-occupancy toll (HOT) lanes, which users can access by meeting a vehicle-occupancy requirement or by paying the market price. These HOT lanes have been created through either the conversion of existing HOV lanes or the construction of new express lanes generally operated on the HOT principle. Several studies have modeled the congestion-reduction possibilities of pricing an entire urban freeway system, but the perception of huge political resistance to charging for something long viewed as "free" has deterred any serious attempt to price a freeway system in this country.[1]

The Urban Partnership Competition

Recently, the U.S. Department of Transportation worked to encourage congestion pricing through its Urban Partnership Agreement competition. In this 2006 contest, the agency selected the five best proposals (from among about two dozen submitted) from transportation agencies in large metro areas willing to implement some form of congestion pricing within a two-year time frame. The idea was to entice public officials, with extra federal cash, to pursue bolder approaches than plain-vanilla HOV-to-HOT conversions. Unfortunately, the only two of the five that proposed charging for currently "free" road space—Mayor Michael Bloomberg's plan for congestion pricing in much of Manhattan and San Francisco's plan to charge for using a rebuilt Doyle Drive, a major highway and transit link from the Golden Gate Bridge to the city—fell victim to political opposition. (Two of the other projects involve innovative approaches to HOT lanes in Miami and Minneapolis, and the fifth will use variable tolls to help pay for a replacement bridge in Seattle.)

This author's conversations with people at the Federal Highway Administration suggest that the agency hoped the Urban Partnership Agreement competition would provoke one or more urban areas to propose pricing their freeway systems. In fact, the United States has so decentralized jobs and housing in recent decades that the vast majority of U.S. congestion occurs on urban–suburban freeways. That's an easier problem to address with pricing than congestion on the surface streets of Manhattan or London, since by definition we're talking about a limited-access highway system. With a finite number of entry and exit points, freeway pricing can be implemented cost-effectively by means of transponders and video—simple, well-proven technologies.

Premium Pricing, Premium Service

Thus far, the U.S. toll road community has been largely absent from the congestion-pricing debate, with the exception of the Harris County (Texas) Toll Road Authority's innovative managed lanes, recently opened as part of the Katy Freeway (I-10) reconstruction project. That project involves a public–public partnership between HCTRA and Houston METRO, which will jointly operate the managed lanes,

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using changes in both pricing and vehicle occupancy to ensure uncongested operations on these new lanes, which serve paying individual private vehicles, buses, and car and van pools. This writer has referred to this project as America's first "virtual exclusive busway," because it gives METRO the equivalent performance of an exclusive busway but spares the agency the capital costs of producing one, since those costs will be covered largely or entirely by tolls.

The main question this article addresses, however, is how the owner/operators of *existing urban toll roads* should approach congestion pricing. Toll road operators are in a different position than freeway operators when it comes to congestion pricing because people are already paying to use their roadways. So if recurrent congestion develops on an urban toll road, what is the most cost-effective approach to deal with it? The traditional approach is to increase toll rates sufficiently to support the capital costs of adding enough lane capacity to meet the increased demand.

Many advocates of congestion pricing would disagree, arguing that the congestion on a tollway reflects a failure to price tollway use appropriately. Rather than meeting the greater demand by increasing capacity, their solution would be to shift from fixed to variable toll rates on the entire roadway to reduce demand to the level of existing capacity. Presumably, that would mean that some previous peak-period drivers would switch to off-peak times, some would select a different mode of transportation (car pool, van pool, bus, and so on), some would take a different route (parallel arterials),

and some would simply refrain from making certain trips at all (perhaps via telecommuting or the increased use of trip-chaining, combining several trips into one).

Certainly, we already have very modest peak/off-peak differentials on some of the toll facilities in the New York/New Jersey area, on the Transportation Corridor Agencies toll roads in Orange County, Calif., and on a few other facilities, such as the toll bridges in Lee County, Fla., but those price differentials are far smaller than on a truly market-priced facility such

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as the 91 Express Lanes in Orange County, Calif.

There's another way in which congestion pricing could be used on existing congested urban toll roads. That alternative would be to create premium-priced, premium-service lanes on the toll road itself. The premium lanes would charge variable tolls high enough to provide a specified level of uncongested service during peak periods—perhaps Level of Service B or C. The operator could even offer a money-back guarantee for trip times on the premium lanes. Such guarantees would permit those choosing them to eliminate "buffer time" when estimating how long a trip would take using the toll road. Projects to add premium toll lanes of this sort have been studied by Florida's Turnpike Enterprise and the Miami-Dade Expressway Authority, both for possible application in the Miami area.

Depending on the magnitude of current and projected congestion (indicating the size of the gap between demand and capacity), these premium lanes could be created through some combination of adding new lanes and converting existing lanes. For example, a toll road with three lanes per direction and some room to expand at reasonable cost could add one lane in each direction and convert one of its existing lanes, thereby providing two "regular" toll lanes and two premium toll lanes in each direction. In cases of higher projected traffic growth and more room to expand, two new lanes—both premium—could be added to the existing three regular lanes, making a total of five in each direction. In either case, the higher rates charged on the premium lanes would be justified not only by the higher level of service offered but also on grounds of fairness. New urban lanes created today cost a lot more to build and operate than existing lanes, which may have been built 15, 20, or 25 years ago. So it makes sense that those demanding reduced congestion pay for the added capacity.

This approach takes into account the fact that congestion pricing can produce losers as well as winners. As far back as 1964, researchers R. M. Zettel and R. R. Carll described three broad categories of groups affected by the addition of pricing to an existing freeway (assuming that pricing is

applied uniformly to all lanes of that freeway):

- The Tolled—drivers who pay the toll, because the time savings are worth it;
- The Tolled-Off—drivers who no longer use the road, because it wouldn't be worth the cost of the toll; and
- The Un-Tolled—drivers on other roads whose trips are made worse by the tolled-off.

Two of the three groups are made worse off by congestion pricing in the absence of either compensation or the large-scale provision of alternative forms of mobility. And in the decentralized U.S. suburban landscape, it isn't easy to provide transit that is competitive with driving.

While the specific impact on motorists would be somewhat different for a toll road shifting to real congestion pricing, the same three groups would exist. How large each group might be would depend on the specifics of each metro area, but in general, because most U.S. metro areas practically stopped adding freeway capacity several decades ago, the market-clearing price for zero-congestion freeways would be high enough that the losers would likely outnumber the winners. And that would especially be the case were most of the pricing revenues to be spent on transit alternatives that would provide poor substitutes for the personal mobility offered by automobiles.

Transit works best when its task is to bring workers from various suburbs to a traditional central business district that employs a large fraction of the region's workforce; this is described as a "many-to-one" model. By contrast, most of today's

large metro areas are characterized by the large-scale suburbanization of job locations, with suburb-to-suburb ("many-to-many") now constituting the largest category of commuting. Cars are more flexible and almost always faster, door to door, than transit in this kind of environment.

A More Nuanced View

One of the most thoughtful researchers on congestion pricing is Kenneth Small of the University of California, Irvine. Small has spent more than a decade studying the two existing California HOT lanes projects, the I-15 express lanes in San Diego and the 91 Express Lanes on SR-91 in Orange County.

Initially a supporter of the standard "congestion-price the freeways" approach, Small's empirical findings have documented the huge variation in how drivers value both time savings and the reliability of trip times. In a 2006 paper for the *Brookings-Wharton Papers on Urban Affairs*, Small and his colleagues used both stated preference and revealed preference data on travelers in the California HOT lane corridors. The researchers found that time savings ranged in value from about $12 an hour to more than $21 an hour. They also found that the reliability of time savings was valued at anything from a low of $6 an hour to a high of nearly $43 an hour, with a median of about $19.50. Small's research team determined that by adding together the median value of time savings and the median value of reliability, one arrived at a figure close to the peak-period toll actually charged on the 91 Express Lanes.

Small and his colleagues built a model to evaluate the social welfare gains from alternative pricing approaches for a corridor like that of SR-91. By doing so, they were able to verify that the current policy of congestion pricing on the HOT lanes and no pricing on the general-purpose lanes does produce overall social welfare gains, but there definitely are losers as well as winners. Pricing all the lanes at market-clearing levels produces more gains than losses, but the losses to the losers are much higher than the gains to the winners (and considered politically unacceptable by Small and his colleagues). Their best real-world alternative is congestion pricing for the premium lanes and modest peak/off-peak pricing for the general lanes.

In other words, Small now favors two-tier pricing as a better approach to addressing congested freeways than across-the-board congestion pricing of all lanes. One set of lanes would be premium-priced, with a no-congestion guarantee; this approach would be similar to that of express toll lanes such as those on SR-91. Another, larger

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set of lanes would have modest peak-period pricing, aimed at spreading out the peak and eliminating true stop-and-go (Level of Service F) conditions. Small's calculations suggest that with this approach, winners would outnumber losers.

Although Small hasn't directly addressed existing urban toll roads, I think his analysis supports my suggestion for two-tier pricing on congested urban tollways. This approach would recognize that both pricing and capacity expansion have important roles to play in reducing or eliminating the congestion that plagues our large urban areas. Without such pricing, tollway providers risk either spending wastefully on more capacity expansion than is warranted or allowing congestion to fester, undercutting the value proposition that attracts customers to toll roads in the first place. But if providers used congestion pricing on all lanes, they could be accused of monopoly pricing that would drive away many of their customers, producing adverse effects on parallel routes.

Two-tier pricing is a more balanced approach, which takes into account what Small calls the "heterogeneity" of people's value of time saved and of reliability. It allows the tollway to provide extra value to those of its customers with very high values of time and reliability, while still providing added value to its traditional customers. In the process, the premium tolls should provide a significant boost in revenue to pay for the capacity expansion needed for the two-tier system.

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Endnote

1 One of the first such studies, funded by the federal Value Pricing Pilot program in the mid-1990s, modeled the addition of peak-period tolls to the entire Los Angeles freeway system. More recently, Patrick DeCorla-Souza of the Federal Highway Administration has produced several papers on innovative approaches to pricing urban freeways during peak periods.