Commission Briefing Paper 5A-08
Congestion Pricing: Revenue Potential

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Introduction

This paper is part of a series of briefing papers to be prepared for the National Surface Transportation Policy and Revenue Study Commission authorized in Section 1909 of SAFETEA-LU. The papers are intended to synthesize the state-of-the-practice consensus on the issues that are relevant to the Commission's charge outlined in Section 1909, and will serve as background material in developing the analyses to be presented in the final report of the Commission.

This paper presents information on congestion pricing – charging vehicles to use streets and highways during hours when they are congested – as a potential source of revenue to finance transportation facilities. Although its primary purpose is to promote economically efficient use of street and highway capacity rather than to generate revenue, some forms of congestion pricing could generate significant revenues if they were adopted on a sufficiently widespread scale. Recent innovations in information and communications technology have made congestion pricing a more practical option, but important political obstacles must be overcome for congestion pricing to contribute a significant share of total highway-related revenues.

Background and Key Findings

- Several different forms of congestion pricing are possible, including pricing use of only some lanes on individual facilities while leaving others free, pricing all lanes on individual facilities, charging vehicles to cross into or drive within congested areas, and charging vehicles to use all major streets and highways throughout a metropolitan region during peak travel hours.
- Although the main purpose for charging vehicles to use streets and highways when they are congested is to manage congestion rather than to generate revenue, congestion pricing systems that cover large geographic areas or major parts of urban transportation networks could generate significant revenues. More limited congestion charging systems could still generate a significant share of revenues required to construct and operate individual facilities.
- Recent innovations in information and communications technology enable automated calculation of charges, billing of drivers, and compliance enforcement, but repaying initial investment costs and meeting operating expenses for automated charging systems can consume a significant share of their revenues.
- Congestion pricing often faces challenging political obstacles, and because it is an inherently local strategy – as distinguished from national or statewide approaches such as fuel taxation – these obstacles must be overcome in many separate jurisdictions for it to contribute a significant share of total highway-related revenues. Nevertheless, congestion pricing could contribute an important fraction of revenues for constructing and maintaining many individual facilities, such as high-capacity urban expressways.

What is Congestion Pricing?

Congestion pricing includes various systems of charging fees to use streets and highways that vary with traffic and congestion levels. In theory, congestion charges should vary in response to actual traffic and congestion levels, but a more frequent approach in practice is to impose charges during hours of the day when congestion normally occurs. In either case, charges are usually limited to times when facilities are congested (or expected to be), and are low or zero when traffic volumes are light. Congestion pricing thus differs from traditional tolls on turnpikes, bridges, and tunnels, which generally do not vary with traffic levels or by time of day (although a few toll facilities have begun to charge higher tolls during peak periods to manage demand).[1]

The economic rationale for congestion pricing suggests that charges should reflect the costs of delays that vehicles impose on one another in heavy traffic, which include the value of their occupants' additional travel time, increased vehicle operating costs, and the inventory value of their cargo. Charges that reflect these costs would rise rapidly as increasing traffic congestion slows travel speeds, and could exceed $1.00 per vehicle-mile in extremely crowded conditions, but would probably range from $0.10-0.25 per vehicle-mile under more typical conditions. In practice, congestion charges are often set to achieve more easily measured objectives, such as maintaining a predetermined level of service or travel speed or ensuring maximum vehicle throughput on a facility.[2]

Forms of Congestion Pricing

Most current and proposed applications of congestion pricing fall into one of four categories: partial facility pricing, full facility pricing, cordon (or area) congestion pricing, and network-wide pricing. With partial pricing, drivers are charged to use only some lanes of a highway facility during congested conditions, while its other lanes remain free at all times. Under full facility pricing, vehicles are charged for using all lanes during congested periods. With cordon or area congestion pricing, vehicles are charged a fixed fee to enter or travel within a congested zone of an urban area during specified hours, usually coinciding with peak travel periods but sometimes extending for the entire business day. Network-wide congestion pricing – still an untested approach – would entail charges that varied with time of day or actual congestion levels and the distance a vehicle traveled on any of a region's major highways or arterial streets.

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[1] Congestion pricing also makes sense on other transportation modes where overcrowding occurs during peak demand hours, particularly urban mass transit, but this paper focuses on its use for streets and highways.

[2] Congestion pricing is one element of "full (marginal) cost" pricing of street and highway use, long advocated by economists as a means of charging drivers for the costs of building and maintaining streets and highways, as well as for the costs of congestion delays, accident risks, and environmental damages they cause. Full cost charges for road use would vary by vehicle size or weight, the prevailing level of congestion (or time of day), and type of facility, since all of these factors affect road construction and maintenance expenses, the severity and cost of congestion delays, pavement damages caused by heavily-loaded vehicles, accident risks, and the value of environmental damages such as air pollution and vehicle noise. Charges for the cost of congestion delays would be the largest component of full marginal cost prices for all but the largest trucks using urban streets and highways, but would be a much smaller component of full cost prices for heavy-duty vehicles and on rural highways; see FHWA (2000), Table 13.

Partial Facility Pricing

The most common form of partial facility pricing is high-occupancy toll (or HOT) lanes, where vehicles not meeting the occupancy requirement for carpool lanes can pay a toll to gain access to the restricted lane(s). The toll is usually a fixed fee to enter the carpool lane, set to limit the number of paying vehicles using the lane so that it remains free-flowing. One example is the HOT lanes on Interstate Route 15 in San Diego (Brownstone et al. 2003, Supernak et al. 2002a, 2002b, 2003), where carpools and buses are allowed free access to the two high-occupancy lanes, while singly-occupied vehicles can use those lanes only by paying a toll. This charge is recalculated continuously during peak travel periods using data from traffic sensors embedded in the lanes, and prominently displayed at entry points to inform drivers of the current price for using the lanes.

Another form of partial facility congestion pricing is express lanes, where new lanes are constructed on a facility and vehicles are charged a fee – usually fixed, but sometimes variable with distance – to travel in them. This fee can vary by hour of the day or may be adjusted in response to actual traffic conditions on the facility, but in either case is usually set to ensure that vehicles in the express lanes can travel near the speed limit. One prominent example is the Express lanes on State Route 91 in Orange County, California (Boarnet and Dimento 2004; Sullivan 2000, 2002; www.91expresslanes.com), where most vehicles are required to pay a fixed toll to travel their 10-mile length.3 The toll varies by hour and day of the week based on recent travel patterns on the facility, and is adjusted periodically to ensure free-flowing travel on the Express lanes at all hours. An important feature of both HOT and express lanes is that they offer the previously unavailable option of uncongested travel in exchange for paying a fee, and on each trip drivers can continue to travel in the congested lanes at no charge, or pay the prevailing toll to travel faster in the express lanes.

Full Facility Pricing

Full facility congestion pricing is similar to partial facility pricing, except that all lanes are priced and all vehicles must pay the tolls unless specifically exempted. Two widely- cited examples of full facility pricing include the Route 407 Electronic Toll Road in Toronto, Canada (www.407.etr.com), and the New Jersey State Turnpike (Federal Highway Administration 2006). Full facility congestion pricing has so far been implemented only on highways where tolls have historically been charged, and on newly-developed facilities where tolls have been charged from the outset. Because tolls on most of these facilities are intended mainly to repay construction costs and only secondarily to manage congestion, they are typically only modestly higher during peak usage periods than at other hours. In contrast, partial facility pricing is primarily intended to manage congestion on some lanes of a facility, and charges tend to be high during peak periods but zero at other times of the day.

Cordon (or Area) Congestion Pricing

Cordon or area congestion pricing systems charge vehicles a fixed fee for entering or traveling within a particularly congested area – usually an urban area's downtown – during peak travel hours, or in some cases the entire business day. Its objective is to reduce congestion on all

[3] Carpools with three or more persons, zero-emission vehicles, motorcycles, and disabled drivers travel for free during most hours, but must pay 50 percent of the toll for travel during peak hours on weekdays; once a target debt service coverage ratio has been achieved, however, such vehicles will be allowed to travel for free at all times.

streets and highways within the cordon area, rather than on individual facilities. The best-known examples of area pricing are Singapore's Electronic Road Pricing (ERP) Program (Fabian 2003; Goh 2002; Phang and Toh 1997) and London's more recent downtown congestion management system (Santos and Shaffer 2004; Transport for London 2004, 2005). Singapore's ERP program uses an electronic toll system to manage the flow of traffic along congested expressways leading into and out of the city and entering its central area during peak travel hours. Vehicles are assessed a toll each time they cross the CBD boundary during morning and evening rush hours, and the toll can vary from one entry point to the next depending on the level of congestion at each entry.

London's congestion pricing program requires drivers to pay a fee of £8 (originally £5) to drive or park within the city's 22-square kilometer central business district (CBD) anytime between 7:00 a.m. and 6:30 p.m. on weekdays. The fee is only required to be paid once per day, regardless of the number of times a vehicle enters or exits the charging zone. Emergency vehicles and taxis are exempt from the charge, and residents within the zone pay a reduced fee. The Norwegian cities of Oslo, Trondheim and Bergen have had toll "rings" (cordons) for many years, originally initiated as a means for financing transportation improvements (Ieromonachou et al. 2006). More recently, Stockholm also conducted a trial experiment in cordon pricing, and its residents subsequently voted to continue the program. No comparable large-scale cordon tolls have been established in the U.S., although San Francisco and New York City are currently studying the feasibility of imposing charges for entering or traveling within their downtown districts during the hours when streets are most congested (Federal Highway Administration 2006).

Network-wide Congestion Pricing

With this approach, vehicles would be charged for traveling on all designated highways and major arterial streets within a metropolitan area. Charges would be highest during peak travel periods, and would increase with the distance vehicles traveled on the designated facilities. Although no applications of network-wide congestion pricing have been attempted, Great Britain is currently planning a nationwide system of network pricing.[4] In the U.S., the state of Oregon is currently conducting a pilot test to examine the potential for mileage-based fees on vehicle use to replace motor fuel taxes for funding street and highway construction. Some participants in Oregon's test are assessed per-mile charges that are constant throughout the day, while others pay lower per-mile fees for travel during off-peak hours but are assessed supplemental charges for driving during peak travel periods (http://www.oregon.gov/ODOT/HWY/RUFPP/mileage.shtml).[5]

Congestion Pricing As A Revenue Source

Predicting the share of total U.S. highway revenue needs that congestion pricing could contribute is difficult because it is a locally-adopted rather than a nationwide strategy, and there is significant uncertainty about how widely and rapidly it will be adopted. Not only is the number

[4] Adams, Christopher, "Road-Pricing Move to Tackle Congestion," *Financial Times*, online, (August 7, 2006), http://www.ft.com/home/us search on "road pricing"; "Motorists Must Pay for Road Use," *BBC News*, online, (December 1, 2006), http://news.bbc.co.uk/2/hi/uk_news/politics/6160877.stm.

[5] The Puget Sound Regional Council in Seattle, Washington has recently completed a pilot test of residents' response to this idea (http://www.psrc.org/projects/trafficchoices/index.htm).

of localities that might ultimately adopt some form of congestion pricing difficult to predict, but the specific form of pricing that individual metropolitan areas are likely to use and the extent of their street and highway systems that might be included in pricing systems cannot be reliably anticipated. Most important, the number of urban areas likely to adopt downtown-area cordon pricing or comprehensive pricing of their regions' street and highway networks – the forms of congestion pricing with the highest revenue-raising potential – is likely to be limited, especially in the near term. Congestion tends to be limited to major streets and highways in urban areas, so congestion charges have little rationale or revenue-generating potential on rural roads and highways. However, congestion pricing of some individual facilities in urban areas could generate revenues sufficient to cover their operating and maintenance expenses, and perhaps to fund part of their reinvestment or expansion costs.

Potential Revenues from Facility Pricing

Because it imposes charges on only a fraction of vehicles using a facility, potential revenues from partial facility congestion pricing seem likely to be limited. Although a growing number of such projects are being studied, only a handful have actually been implemented, and their current revenue yields are typically modest. Total annual revenues for San Diego's I-15 HOT lanes are approximately $2 million, and these must first fund the system's $750,000 annual operating expenses as well as a $60,000 annual reimbursement to the California Highway Patrol for conducting enforcement activities (http://fastrak.sandag.org/fundrev.html).[6] Since most or all vehicles are charged to use them, toll lanes on congested facilities may have higher revenue potential. California's SR91 Express lanes reportedly generate approximately $40 million annually at current toll levels (which can reach $8.50 for the 10-mile trip during peak demand hours), but annual expenses toll collection and facility maintenance consume a significant share of this total.

Partial facility pricing would probably have to be adopted on a significant fraction of the nation's urban expressway mileage for its aggregate revenue potential to represent a significant fraction of annual highway maintenance and investment outlays. Potential revenues from full facility congestion pricing – where users of all lanes are charged during congested periods – are somewhat larger, and should easily be sufficient to meet a typical facility's operating and maintenance expenses, and in many cases to finance its periodic reconstruction and even construction of additional lanes.

Revenues from More Comprehensive Pricing

In contrast, cordon or area pricing programs would be expected to generate more significant revenue streams because of the larger numbers of vehicles subject to charges. London's downtown congestion charging system now raises approximately $360 million annually in toll revenues, although operating and enforcement expenses currently consume about half of this total. Toll collections under Singapore's central area and expressway pricing system now total slightly more than $50 million annually, while the system's yearly administrative expenses are about $10 million.[7] Stockholm's experimental downtown congestion pricing system generated

[6] The remainder is used to subsidize express transit services on the facility and along the corridor where it is located.

[7] In both cities, revenues are devoted primarily to transportation improvements, particularly expansion of bus and rail transit service (Goh 2002, Santos and Shaffer 2004).

revenues at a rate slightly over $100 million annually, of which one-quarter paid for administrative and enforcement costs.

Revenues from network-wide congestion tolling, which could encompass all lanes on much of an urban area's street and highway network and would factor distance traveled as well as time-of-day into the prices vehicles were charged, would be correspondingly larger.

Limits on Pricing Revenue

Even if congestion charges were widely used to manage peak-hour travel demand, expanding the capacity of many major streets and highways would still produce delay savings and other benefits that exceeded its costs. Funding more of these economically desirable expansion projects would increase annual revenue demands for financing the necessary investments. By reducing congestion levels on facilities that were expanded, however, increasing investment levels would also reduce the revenues that congestion pricing could generate, particularly where charges were periodically adjusted to reflect actual delay costs. Conversely, funding fewer capacity expansion projects would reduce revenue demands, but would increase congestion levels and potential revenues from congestion charges that reflected actual delay costs.

Stability of Future Revenues

The revenue stream generated by congestion pricing would be expected to grow over the longer run, as growth in population, household members' participation in activities outside the home, and business activity combine to increase travel demand. Gradual spreading of household and business travel demands throughout the day may limit growth in congestion during morning and evening peak travel periods, but would also cause congestion to spread throughout more of the day, thus extending the hours when congestion charges are appropriate and increasing the revenue they could generate.

In the short term, however, revenues from congestion pricing will vary in response to fluctuations in traffic levels caused by factors such as changing fuel prices and cycles in business activity, which can be surprisingly large or sudden. If charges for using congested facilities are adjusted to reflect actual congestion levels, price adjustments will reinforce variation in revenues caused by fluctuations in travel demand, thus introducing potentially significant short-term variability into revenue streams generated by congestion pricing.

Responsiveness to Inflation

Ensuring that congestion pricing revenues keep pace with economy-wide price inflation will require periodic increases in congestion charges, unless tolls are indexed to some regularly-issued measure of inflation. By eroding the real (or constant-dollar) value of congestion charges, price inflation will also increase demands for peak-period travel, thus permitting – or even requiring – higher nominal charges to prevent congestion from growing. Historically, special-purpose authorities responsible for operating toll highways or bridges and tunnels have been reasonably opportunistic in raising tolls to keep pace with inflation, although legislative bodies in charge of toll-setting have generally proven no more willing to increase tolls than to raise fuel tax rates regularly to compensate for inflation. In any case, indexing or periodically raising congestion charges to compensate for inflation needs to be carefully distinguished from adjusting charges to reflect changes in congestion levels.

Incentives for Economic Efficiency

Where charges are set to reflect the economic costs of delays that vehicles impose on one another in congested travel conditions, congestion pricing can provide a strong incentive for efficient use of highway capacity. Drivers will compare the benefits they experience from traveling on congested facilities at hours when pricing is in effect to the charges they are assessed, and will re-route, reschedule, or forgo trips whose benefits cannot justify paying those charges. Through this sorting-out process, congestion pricing can ensure that limited street and highway capacity is used during peak demand periods to accommodate trips that provide the highest economic value to travelers and shippers.

At the same time, congestion pricing can help to channel investments in expanded transportation system capacity to facilities where adding capacity generates benefits that exceed the costs for doing so, and thus meets a basic test of economic efficiency. If congestion charges on a facility are set to reflect delay costs and generate revenues that are sufficient to finance expanding its capacity (such as by adding lanes), this indicates that adding capacity can increase the economic benefits it produces by allowing the facility to carry more high-value trips and shipments during peak periods. In effect, relying on congestion pricing to finance capacity expansion would ensure that potential investments meet an economic efficiency criterion before they could proceed.

Equity Considerations

One basic principle of equity – often referred to as "horizontal" equity – is that people in identical circumstances should be treated equally. In the context of congestion pricing, this principle requires charging identical prices to vehicles that impose equal costs on other street and highway users in congested conditions. Relying on fuel taxes to charge vehicles for using streets and highways while allowing congestion to ration their limited capacity creates horizontal inequity among users, because vehicles traveling during peak periods impose expensive delays on others but pay essentially the same charges as those traveling when they do not delay other traffic. Congestion pricing can remedy much of this horizontal inequity by charging vehicles that travel on congested routes and at peak travel hours higher prices to reflect the costs of the additional delays they cause.

A more complex equity issue, referred to as vertical or distributional equity, is how a policy's benefits and cost burden are distributed among people with different incomes; in the context of congestion pricing, this amounts to asking how the value of faster rush hour travel and the burden of paying for it through congestion charges are viewed by travelers with different incomes. It is difficult to match travelers' income characteristics to the actual times and routes they travel or the congestion levels they encounter, but household surveys suggest that rush hour travelers going in the busier direction – and thus most likely to pay congestion charges – are the most affluent group within the larger category of street and highway users.[8] Where only some lanes on a facility are priced, survey evidence shows that different drivers pay to use them on

[8] Not all those traveling in the peak direction during rush hours have high incomes, but few are typically drawn from the lowest income groups (and some of these may have only temporarily low incomes), while off-peak highway travelers, those using uncongested routes or traveling in the non-peak direction during rush hours, and transit users all exhibit lower average incomes.

different days, but on average those who use the priced lanes are more affluent than drivers who travel in the remaining free lanes.

At the same time, congestion charges create benefits in the form of time and operating cost savings for users who elect to pay them, and these benefits are most valuable to travelers and shippers with the highest values of speed and predictability of arrival times. Insofar as these are high-income individuals and business owners – and empirical evidence shows that travelers' values of speed and reliability do increase with their incomes – the benefits they receive from paying congestion charges in exchange for faster and more reliable travel will increase in rough proportion to their incomes. By increasing the effective capacity of selectively priced lanes, partial-facility congestion pricing may also offer some savings in travel time even to those who continue to travel in the remaining unpriced lanes on those facilities.

Distributing pricing revenues to adversely-affected travelers could redress resulting inequities, although identifying exactly who should receive payments and developing a mechanism to distribute them present important challenges. Direct payments would be the most effective form of compensation, but it may be difficult or impractical to limit recipients to those who were genuinely harmed by congestion pricing. A reasonable alternative might be to reduce fuel tax rates in proportion to the amount of fuel tax revenue that could be replaced by proceeds from congestion pricing, although fuel tax payments are unlikely to be a good proxy for losses in individual drivers' welfare from foreclosing their option to travel free during congested hours. Using some pricing revenues to improve transit service, as is done in San Diego, London, and Singapore, may also assuage equity concerns by providing high-quality travel alternatives for those unwilling to pay congestion charges.

Administrative Costs

The cost burden for collecting congestion charges does not appear to compare favorably to those for broader-based fees such as the current fuel tax. Expenses for the few working examples of automated congestion charging systems appear to consume 40-50% of their gross revenues when operating and administrative expenses, charges to amortize their initial capital outlays, and policing and enforcement costs are included. Continued evolution in technologies for vehicle identification, charging, and billing may reduce this burden, although probably not to the extremely low levels of some alternative financing mechanisms. Improving technology may also help to reduce revenue losses from evasion of congestion charges, but some tradeoff between enforcement outlays and revenue losses due to evasion is likely to remain.

Barriers to Implementing Congestion Pricing

Technological Capabilities

Recent advances in information and communication technology offer several possible approaches for identifying vehicles using priced facilities, assessing charges, and enforcing compliance with pricing systems. The simplest approach relies on in-vehicle transponders that communicate with roadside receivers located along priced facilities to identify users and calculate charges. On California's I-15 HOT lanes and SR-91 Express lanes, roadside receivers record the passage of vehicles and periodically issue bills for recent trips to their owners. In Singapore's ERP program, in-vehicle transponders are coupled with pre-paid cash cards that are automatically debited each time the vehicle passes a charging point.

London's cordon charging system relies on a more complex system of digital cameras and license plate recognition software to compile a list of vehicles that have traveled within the charging zone during each day.[9] Drivers are billed immediately, and required to pay the charge by midnight on the day in which the travel occurred. Each day's list of vehicles detected by the cameras is compared against those for which payment was received, and any drivers found not to have paid the charge are assessed a penalty.

Network-wide congestion pricing would probably require an even more complex system of onboard computers equipped with GPS receivers, digital road network maps, charge rate tables, and wireless communications, which would measure and tabulate the number of miles driven on each priced facility at different times of the day and calculate the corresponding charges. Vehicles' computers would also transmit these data to the billing agency so that the required fees could be assessed. This approach is used in both the Oregon and Puget Sound pilot tests, and could also enable localities to charge mileage-based user fees. In fact, proponents of mileage fees often note that the technology required to administer fees across multiple jurisdictions would also enable network-wide congestion tolls.

Political Obstacles

Congestion pricing usually faces challenging political obstacles, and because it is a local strategy these obstacles must be overcome in many separate jurisdictions for it to contribute a significant share of total highway-related revenues. Most important, many drivers who currently travel in congested traffic are likely to view themselves as better off than if they were required to pay charges to use the same facility at their accustomed hours, and these users represent an obvious source of opposition to proposals for congestion pricing, particularly of entire facilities or areas. Drivers and public officials may protest that congestion pricing of existing streets and highways represents double taxation, since their construction has previously been financed by fuel and property taxes.[10] Rush hour drivers and shippers may also doubt whether congestion charges will actually deter enough other users to reduce congestion measurably, in part because most previous efforts to curb congestion have had so little effect. Finally, retail merchants and other business establishments in dense urban centers where congestion charges would be high are likely to be concerned that pricing could drive away customers.

Assessing Congestion Pricing's Potential

While *potential* revenues from universal reliance on congestion charges might eventually approach those now generated by fuel tax revenues, congestion pricing appears unlikely to be adopted broadly enough to finance a major share of spending for streets and highways in the foreseeable future.[11] Despite their significant revenue-raising potential, area or network-wide

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[9] The system utilizes over 200 cameras, some of which are mounted at fixed points and others of which are moved randomly within the zone.

[10] On most streets and highways, however, users' tax payments are well below the costs of providing the capacity necessary to accommodate rush-hour traffic volumes.

[11] Federal and state fuel taxes currently average about $0.40 per gallon, while the fuel economy of the nation's vehicle fleet averages roughly 20 miles per gallon, so fuel taxes generate about $0.02 in revenue per mile driven. In contrast, congestion charges that reflected actual delay costs would probably range from $0.10-0.20 per mile, so that their average value for all travel could approximate that of fuel taxes even if only 10-20% of all mileage were subject to congestion charges.

pricing systems seem likely to be opposed – at least initially – by commuters who prefer the option of unpriced travel, public officials who are unconvinced that charges will actually reduce rush-hour congestion, and business leaders who fear that congestion pricing will harm downtown commerce or retail activity. In metropolitan areas where these obstacles can be overcome, however, broad-based congestion pricing systems could produce major reductions in congestion levels while also making important contributions toward transportation revenue needs, and few if any other funding strategies offer this same advantage.

More limited applications of congestion pricing, such as charging singly-occupied vehicles to use existing HOV lanes or using congestion charges to fund construction of new lanes on major facilities, appear likely to be widely adopted. While their revenue potential is more limited, these systems could still contribute an important share of revenues needed to operate and maintain many major facilities, and could finance some critical capacity expansion projects that are now stymied by inadequate funding. Charging vehicles to use all lanes on major urban expressways during rush hours, while more controversial, could probably generate much of the revenue required to maintain, reconstruct, and where justified, expand many of these facilities. Perhaps more important, even these smaller-scale applications of congestion pricing have the potential to reduce *congestion* significantly on metropolitan areas' most heavily-used highway facilities, and it is important to recall that this – rather than raising revenue – is their primary purpose.

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CONSOLIDATED COMMENTS FROM MEMBERS OF THE BLUE RIBBON PANEL OF TRANSPORTATION EXPERTS - PAPER 5A-08

Several reviewers combined their comments as follows:

Recognizing that this paper was required to be limited in its length, the reviewers offer the following more expansive comments:

If traffic congestion is viewed as a tax, with the proceeds wasted, then paying congestion charges can be viewed as yielding revenues that can be used to mitigate the waste of congestion. Congestion charges not only provide a source of revenue to build new facilities, but, more importantly, by making more efficient use of existing facilities, they reduce the need for new facilities.

As the Texas Transportation Institute reports each year, investments in public transit reduce the costs of traffic congestion in congested urban areas (e.g. by a billion dollars annually in the Washington D.C. region). Congestion pricing needs to be preceded by investments in transit to provide better options for those who choose not to pay the charges. Better transit also inhibits diversion to parallel streets and roads. The FHWA Value Pricing Program and USDOT's Urban Partnership Agreements recognize the essential lead role of transit.

The paper could more clearly differentiate between variably priced premium facilities and full-on pricing of all lanes or all driving on all routes – also known as "system or system-wide tolling." The former, especially when new capacity is created for it, appears to be acceptable to the public and offers useful choices (e.g. SR 91, I-15, etc.).

Congestion pricing will not be implemented without difficulties. It offers even more opportunities and temptations to "tweak" the pricing system for a wide variety of objectives. The paper notes, for example, that SR 91 exempts ZEV's and disabled drivers. Neither has a congestion-reduction basis. The likelihood that endless modifications will be imposed on congestion pricing charges is probably multiplied by their inherently regional and local nature – unlike fuel excise taxes, individual jurisdictions can "layer on" their version of charges based upon their local needs and objectives. The results would be bewildering differences and complexities, lack of public confidence, and diverting travel to non-priced arterials and local roads, or around areas with particularly onerous charges. There also may be a strong temptation to use pricing as a revenue raiser that will not necessarily be dedicated to transportation uses.

The paper does not explicitly recognize that congestion pricing remains in its early maturation period, with viable technological applications to enable implementation of the concepts only being available for a little over a decade. This paper could balance an assessment of future revenue potential better by also addressing how changes to existing policy and practices could enhance revenue potential and congestion management benefits of congestion pricing.

The paper does not have future-based orientation -- assuming no changes to today's laissez-faire federal role in supporting congestion pricing. The consequence is a discussion framework that limits the revenue-generating potential of congestion charging by limiting solutions to locally-generated approaches, business models and technologies that address local situations and environments. The value of local approaches is ideal for allowing the flexibility to advance programs that demonstrate benefits and address difficult local politics, and is probably appropriate for a maturing congestion management and financing mechanism.

In this respect, the section on "Assessing Congestion Pricing's Potential" should indicate that congestion pricing in major metropolitan areas could also make it possible to avoid, or at least defer, capital investment, in addition to generating capital investment dollars. Again, particularly for densely developed areas, the paper should address the feasibility of using new dollars for transit rather than for new or expanded roadways.

The absence of a larger federal policy and funding foundation, however, will likely continue the trend of only enabling local approaches to congestion charging. As a consequence, the long-term revenue potential is likely to remain limited to locally generated revenues that serve a niche role in transportation finance. New federal policy and funding directions could enhance the revenue potential beyond a scattering of local programs.

The limiting premise of this paper is encapsulated in the beginning of the section entitled "Congestion Pricing As A Revenue Source" (top of page 5), which states: "Predicting the share of total U.S. highway revenue needs that congestion pricing could contribute is difficult because it is a locally adopted rather then nationwide strategy…" The reviewers suggest that the Commission consider whether new policies can reduce the uncertainly of congestion pricing as a revenue source by enabling more wide-scale applications. A first step in this direction might be for the next surface transportation bill to establish national initiatives that might advance national models of transportation electronic payments systems that encourage interoperability through the establishment of standards for telecommunications, financial clearing and reciprocity, and data exchange that promote open systems designs that can be integrated within and among regions.

The paper could also recognize the opposition that inter-city travelers and national trucking concerns have regarding the difficulty that differing charging systems, technologies and approaches may present in the future in terms of ease of use, understanding of travel charges and options, and equity of cost distribution for use of the transportation system. The opposition of these groups will grow and future revenue-generating potential of congestion pricing will be limited, if fragmented local solutions perpetuate.

While this paper has limited its focus to highway and roadway pricing, the discussion of network-oriented congestion charging approaches is lacking due to the absence of network implications. Some recognition of traffic diversion and modal diversion would be valuable, as well as consideration of the revenue generation and investment needs to support to advance across the network, including transit.

Finally, when it comes to congestion pricing of existing facilities, there are several inter-related issues that need to be considered: (1) Most congestion pricing concepts only price freeways and other high-capacity arterials; (2) In many large cities, there are few freeway alternatives; and (3) Large proportions of drivers are willing to divert their routes to avoid a small (toll) expense. This means the application of congestion pricing to only freeways and other high-capacity highway facilities is likely to undo transportation and land use plans, and is likely to shift large amounts of traffic to local streets and through neighborhoods. These problems need to be thoroughly considered before implementing congestion pricing on existing facilities.

Oregon's concept (charging all traffic within a congested, general area during peak hours, regardless of facility) solves these problems.

More Detailed Comments:

Page 1, Background and Key Findings, Second Bullet – The second bullet could be more balanced. Congestion management is not always the "main purpose" of congestion pricing applications. Different applications have placed varying emphasis on congestion management and revenue generation as two primary objectives of congestion pricing.

Page 1, Background and Key Findings, Third Bullet – This bullet makes a very important point about the cost of designing, constructing, implementing, operating and maintaining road charging systems – these are not inexpensive undertakings. More research into best practices and lessons learned would be valuable to facilitate implementation of future projects and potentially identify opportunities to leverage economies of scale.

Page 1, Background and Key Findings – This section should clarify that congestion pricing works best in tandem with newly generated revenues being used to fund transit alternatives.

Page 2, What Is Congestion Pricing?, Second Paragraph – The generic ranges of cost-per-mile charging rates can be misleading and would be better characterized by citing cost-per-mile examples from existing projects or planned projects. The discussion should recognize that value of time and willingness to pay are two critical variables that determine the viability of pricing structures, and can vary significantly by region and type of project. This section should also include reference to a policy objective of moving more people to travel off-peak (and generate revenue to support transit).

Page 2, Footnote 2 – The description of full marginal cost pricing does not address the societal costs of incremental delay and congestion created for other road users by any individual driver's choice to consume road capacity at any time of day. While difficult to quantify, this is a real component of marginal costs that must be considered.

Page 3, Partial Facility Pricing, First Paragraph – The I-15 project should be recognized for its approach in dynamically established prices that change based on actual traffic conditions to guarantee travel speeds. This is the most technologically advanced application to manage road infrastructure for free-flow conditions. This section should also make it clearer that pricing should vary in order to keep traffic flowing.

Page 3, Full Facility Pricing, First Paragraph – The reference to the NJ Turnpike is not particularly relevant since the roadway has eliminated its congestion pricing program. A better example would be to reference the Harris County Toll Road Authority all-electronic roadway in Texas.

Page 4, Cordon (or Area) Congestion Pricing, Second Paragraph – The London example should reflect the new larger congestion charging zone that was put in place beginning on February 19, 2007, which has essentially doubled the size of the charging zone.

Page 4, Cordon (or Area) Congestion Pricing, Second Paragraph – Some discussion of the relevant operations expenses of the international examples would be valuable to get at the notion of net revenue availability from the various approaches. The expense to operate London's video-based system has impacted its net revenue generating capability. The Norwegian examples have generally approved tolling for a limited number of years to finance infrastructures construction costs rather than operations and maintenance. The Stockholm system has combined radio-frequency toll transponders with video imaging technology to collect tolls, which reflected more initial investment, but may serve to promote more efficiency and lower operating costs.

Page 5, Potential Revenues from Facility Pricing, Second Paragraph – This paragraph contains very broad conclusions and need to be better supported. The statements about Partial Facility Pricing are probably too pessimistic and the conclusions about the potential of Full Facility Charging to cover capital and operating costs are probably too robust. These conclusions must take into account a rate setting mechanism that will be determined by value of time, willingness to pay, and levels of congestion. The discussion also must reflect the options that are available and network impacts of diversions to free roads or other modes. Use of revenue must reflect network impacts and needs as well as impacts for the priced roadway.

Page 5, Revenue from More Comprehensive Pricing, First Paragraph – The conclusion about cordon approaches having greater revenue potential "because of the larger number of vehicles subject to charging" is missing the fact that freeways and turnpikes handle just as many (if not more) vehicles over larger geographies. These full facilities probably have just as much revenue potential as more concentrated cordon approaches.

Page 6, Revenue from More Comprehensive Pricing, Third Paragraph – While revenue generation from network –wide congestion tolling would be greater, so are the costs and investments required to ensure network readiness to address the temporal, modal, and alternative roadway shifts that are likely to result from network approaches. The costs and investments required to make these approaches viable should be explored.

Page 6, Responsiveness to Inflation, First Paragraph – This is a very important point and policy consideration to protect against erosion of purchasing power of revenue streams. Inflationary adjustments are well positioned to help maintain operating cost coverage targets, but must also be supplemented to consider life-cycle asset management needs for infrastructure and systems. This added financial need suggests greater revenue requirements that inflationary adjustments may provide alone.

Further, regarding legislative bodies' willingness to increase tolls. There is a popular hypothesis that indexing is more likely to be authorized for a direct user fee than an indirect user fee (e.g., fuel taxes). While the authors' point is probably correct, this hypothesis should be mentioned.

Page 8, Equity Considerations, Third Paragraph – Perhaps some reference to recent research into value of time for low income travelers would be valuable, which suggests surprisingly high value of time for hourly wage earners, just not on a sustained day-to-day basis.

Page 8, Equity Considerations, Fourth Paragraph – The discussion of distribution of pricing revenues to adversely- affected users would benefit from a reference to credit-based solutions in which travelers in congested free lanes could earn credits that may be applied for use in priced roadways or on transit. (See FAIR lanes description referenced at www.fhwa.dot.gov/policy/otps/fairlanes.htm and www.hhh.umn.edu/centers/slp/projects/conpric/learn/types_a.htm.)

Page 8, Administrative Costs, First Paragraph – The paper covers administrative costs of congestion charging (p. 8), and notes that "the cost burden for collecting congestion charges does not appear to compare favorably to those for broader-based fees such as the current fuel tax." The paper then cites a 40 to 50 percent operational and administrative cost of congestion fees collected. This may be true for the limited number of congestion pricing systems examined, perhaps a better benchmark would be the experience of toll operators in managing sophisticated electronic toll collection systems, which would offer comparable functionality and suggest much lower operating cost coverage requirements.

In addition, over the past 10 years, the efficiency of ITS technology has been rising and costs have dropped dramatically for a number of technologies. Also, the comparison may not include the total cost for collecting the current fuel tax. When one adds in the cost of gas tax evasion and also the cost of collecting and administering state-level fuel taxes in addition to federal fuel taxes, the analysis might show something other than a marked difference.

The statement that “repaying initial investment and meeting operating expenses for automated charging systems can consume a significant share of their revenues” may be overstated, and does not take into account potential labor savings.

An additional cost-lowering possibility stems from the potential for multi-purpose uses of the same technology-administrative structure. For example, under Oregon’s concept for area-wide peak hour charges piggybacked on a VMT fee, administrative expense for adding the congestion pricing system would be near zero (although some additional enforcement effort would be necessary).

Page 8, Barriers to Implementing Congestion Pricing–Technical Capabilities – The technology exists, as the paper notes. Technology is only making congestion pricing easier to manage and implement and less expensive to operate. The policy issues are more difficult than the technology issues.

Further, the paper notes that “Recent advances in information and communication technology” for identifying vehicles for congestion charging. There have been several new technology innovations in recent years, including improvements in existing electronic tag systems and the advent of several new means. These advances will continue to drive down the cost of technology over time.

An example of how technology can work is the Oregon pilot test, which does not use a “billing agency” as the term is commonly used in this area. There is communication with a central computer, but the actual billing is automatically handled by service stations’ point-of-sale systems. (Again, this reduces administrative costs).

Page 9, Barriers to Implementing Congestion Pricing – Technical Capabilities, Second Paragraph – The reference to London should be updated to reflect the fact that the requirement to pay by midnight on the day that travel occurred has been relaxed with a longer grace period before penalties are assessed.

Page 9, Barriers to Implementing Congestion Pricing – Technical Capabilities, Third Paragraph – The discussion of GPS applications for network-wide congestion charging could be complemented with a mention of other technological options, including cellular phone probe models and the future application of 5.9 GHz on-board units to be used for road charging.