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Report to the Subcommittee on Transportation, Housing, and Urban Development and Related Agencies, Committee on Appropriations, House of Representatives

January 2012

TRAFFIC CONGESTION

Road Pricing Can Help Reduce Congestion, but Equity Concerns May Grow

GAO-12-119

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GAO Highlights

Accountability * Integrity * Reliability

Highlights of GAO-12-119, a report to the Subcommittee on Transportation, Housing, and Urban Development and Related Agencies, Committee on Appropriations, House of Representatives

Why GAO Did This Study

Many Americans spend frustrating hours each year stuck in traffic. While estimates vary, the Department of Transportation (DOT) estimates that traffic congestion costs the United States $200 billion each year, and that more than one-quarter of total annual travel time in metropolitan areas occurs in congested conditions. Road pricing or congestion pricing—assessing tolls that vary with the level of congestion or time of day—aims to motivate drivers to share rides, use transit, travel at less congested times, or pay to use tolled lanes. Since the first U.S. congestion pricing project opened in 1995, 19 project sponsors have 41 pricing projects in operation or under construction. About 400 miles of priced highway lanes including nearly 150 miles on the New Jersey Turnpike are in operation today with current tolls varying from 25 cents to $14.

All U.S. projects in operation are either High Occupancy Toll (HOT) lanes, which charge solo drivers to use newly constructed lanes or carpool lanes, or peak-period pricing projects, which charge a lower toll on already tolled roads, bridges and tunnels during off-peak periods. GAO examined (1) the federal role in supporting congestion pricing, (2) results of U.S. congestion pricing projects, and (3) emerging issues in congestion pricing. Eight project sponsors have current and completed evaluations on at least 1 project, for a total of 14 evaluated projects, all of which GAO reviewed. GAO interviewed officials about the performance of their pricing projects and effects. DOT provided technical comments, which GAO incorporated as appropriate.

View GAO-12-119 or key components. For more information, contact Phil Herr at (202) 512-2834 or herrp@gao.gov.

What GAO Found

DOT approves all congestion pricing projects on roadways that receive federal funds and provides grants for project studies, implementation, and evaluation. Nearly all HOT lane projects and most peak-period pricing projects in operation today received federal funds at one time or another. DOT's largest programs for congestion relief, the Urban Partnership Agreement and Congestion Reduction Demonstration programs, have provided grant funds totaling nearly $800 million since 2006 to six metropolitan areas to implement pricing and other strategies. DOT requires sponsors of congestion pricing projects to monitor and evaluate performance and, for HOT lanes when applicable, ensure that a federal standard for minimum traffic speeds is met.

The 14 congestion pricing projects that have current and complete evaluations generally show that pricing can help reduce congestion, although other results are mixed, and not all possible relevant impacts have been assessed. HOT lane projects, which aim to reduce congestion by decreasing travel time and increasing speed and the number of vehicles using the lane, have reduced congestion, but some HOT lane projects also added new lanes, and studies did not distinguish the extent to which performance improvements were due to added lanes or pricing. In addition, although the number of cars using HOT lanes has risen, there were fewer people in those cars because of an increase in the proportion of toll-paying solo drivers or a decrease in carpools. Peak-period pricing projects, which aim to reduce congestion by encouraging drivers to travel at off-peak times, have shifted some travel to those times. Other congestion pricing effects—such as equity income impacts—have not always been evaluated. Potential concerns include income equity (whether low-income drivers are disproportionately affected by congestion pricing) and geographic equity (whether one geographic area is more negatively affected than another, such as when traffic diversion occurs). These impacts are important to assess as they address the public and elected officials' concerns about the effects of pricing on travelers and communities. Ongoing multi-year evaluations across six metropolitan areas will assess the performance and effects of congestion pricing projects using a specific set of measures to assess the effectiveness of congestion reduction strategies.

Concerns about equity may grow as pricing projects become more widespread. New projects are under construction, and several metropolitan areas have networks of HOT lanes planned that will expand the relatively limited use of pricing today. Equity concerns may become more acute where sponsors are using pricing not only to manage congestion, but also to raise revenue to build new projects. Raising revenue can be at odds with managing congestion (e.g., increasing passenger throughput) if higher tolls can produce more revenue from fewer paying vehicles. Options to address equity issues include using a portion of toll revenues to finance public transit service.

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Abbreviations

CRD	Congestion Reduction Demonstration
DOT	Department of Transportation
ELD	Express Lanes Demonstration
FHWA	Federal Highway Administration
HOT	High Occupancy Toll
HOV	High Occupancy Vehicle
NEPA	National Environmental Policy Act
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act—A Legacy for Users
SR	State Route
UPA	Urban Partnership Agreement
VPPP	Value Pricing Pilot Program

GAO
Accountability * Integrity * Reliability

United States Government Accountability Office
Washington, DC 20548

January 12, 2012

The Honorable Tom Latham
Chairman
The Honorable John Olver
Ranking Member
Subcommittee on Transportation,
Housing, and Urban Development
and Related Agencies
Committee on Appropriations
House of Representatives

Many Americans spend frustrating hours each year stuck in congested traffic, a situation that costs the country billions of dollars annually and influences people's decisions about where to live and work. As traffic has risen dramatically over the past 3 decades with population and economic growth, congestion now extends to more times of the day, more roads, and more cities and towns—thus affecting more people than ever before. Estimates of the cost of congestion vary; according to the Department of Transportation (DOT), congestion costs America an estimated $200 billion each year in lost travel time and fuel, and drivers in metropolitan areas spent more than one-quarter of their total annual travel time in congested conditions.

Metropolitan areas have undertaken several approaches to reduce congestion, but some approaches are becoming impractical and too costly. For example, metropolitan areas have widened or extended roads to add physical capacity, yet this option may not be feasible in some densely populated urban areas or could have significant social and environmental impacts. Furthermore, adding roadway capacity is costly at a time when governments at all levels are facing fiscal constraints. Metropolitan areas have also attempted to reduce congestion by managing existing infrastructure more efficiently, through traffic management strategies such as timed traffic signals, signs that warn drivers of congestion ahead, and improved responses to accidents. Other strategies, such as carpool or bus-only lanes, have been designed to reduce the number of vehicles on roadways by encouraging people not to drive alone.

Another strategy to reduce congestion is road pricing or congestion pricing—assessing tolls that vary with the level of congestion and time of day. Since the first U.S. congestion pricing project opened in 1995, 19

project sponsors, generally state departments of transportation or local authorities, have 41 pricing projects either operational or under construction—primarily charging solo drivers to pay a toll on newly constructed lanes, existing carpool lanes, or charging a lower toll on tolled highways, bridges, and tunnels during off-peak periods. Concerns on the part of public and elected officials about the fairness of congestion pricing to all users have, however, been a challenge to instituting these projects.

At your request, we examined (1) the federal role in supporting congestion pricing, (2) results of congestion pricing projects in the United States, and (3) emerging issues in congestion pricing projects. To address these objectives, we reviewed relevant legislation, literature, reports, and studies. We interviewed federal officials who oversee programs related to congestion pricing as well as experts in the field. We analyzed congestion pricing project performance from evaluations, related environmental and traffic diversion assessments, traveler surveys, and interviews with state and local transportation officials who have implemented and evaluated projects. See appendix I for our study objectives, scope, and methodology.

We conducted this performance audit from October 2010 through January 2012 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

Traffic congestion is caused by more vehicles on a road than it is designed to accommodate, and it can be exacerbated by several factors. For example, bottlenecks at highway interchanges or on bridges and tunnels can worsen congestion. Vehicles traveling at different speeds can increase the average amount of space between cars, thus not efficiently using all space available in a lane. Stop-and-go traffic leads to increased queuing and periodic events such as traffic accidents and roadway construction can compound already congested conditions. Although a transportation system is designed to handle a certain number of vehicles, the flow of traffic can be improved at certain times and places such as during rush hours or at bottlenecks.

Congestion pricing is designed to improve the flow of traffic by charging drivers a toll that can vary with the level of congestion or time of day. Drivers pay a higher price for using a lane or roadway at times of heavy traffic, and a lower price when and where traffic is light. To avoid toll payment, drivers may choose to share rides, use transit, travel at less congested (generally off-peak) times, or travel on less congested routes. Drivers who place a high value on time may choose to pay the toll to use the priced lane during congested times in return for a faster and more reliable trip. Alternatively, drivers who wish to pay a discounted toll on an already tolled roadway can travel at off-peak times.

Economists generally believe that congestion pricing has the potential to alleviate congestion on roadways in an economically efficient way. Those who value a fast and reliable trip will pay for the option. Drivers who place a lower value on time will choose to stay in the unpriced and potentially more congested roadways. Economists believe that congestion pricing can also enhance economic efficiency by making drivers take into account the external costs they impose on others when making their travel choices. Any given driver's highway use entails extra costs that the driver does not bear, in the form of congestion, noise, and pollution. Thus, paying a toll that reflects a driver's value of time and covers external costs can potentially reduce congestion and the demand for road space at peak periods. We have reported that the existing infrastructure can be managed more efficiently and that congestion pricing could be one method to do so.[1]

All congestion pricing projects in the United States have used either (1) High Occupancy Toll (HOT) lanes or (2) peak-period pricing on already tolled facilities. HOT lanes have been created by constructing new lanes or converting existing carpool or High Occupancy Vehicle (HOV) lanes, some of which had been previously underused, and allowing solo drivers to use these lanes if they pay a toll. Users of the prior HOV-only lanes, such as carpools and express buses, generally continue to use the lanes for free and are allowed to use newly constructed HOT lanes for free as well. HOT lane operators seek to influence the number of vehicles in the HOT lane and maintain 45- to 55-mile-per-hour travel speeds through

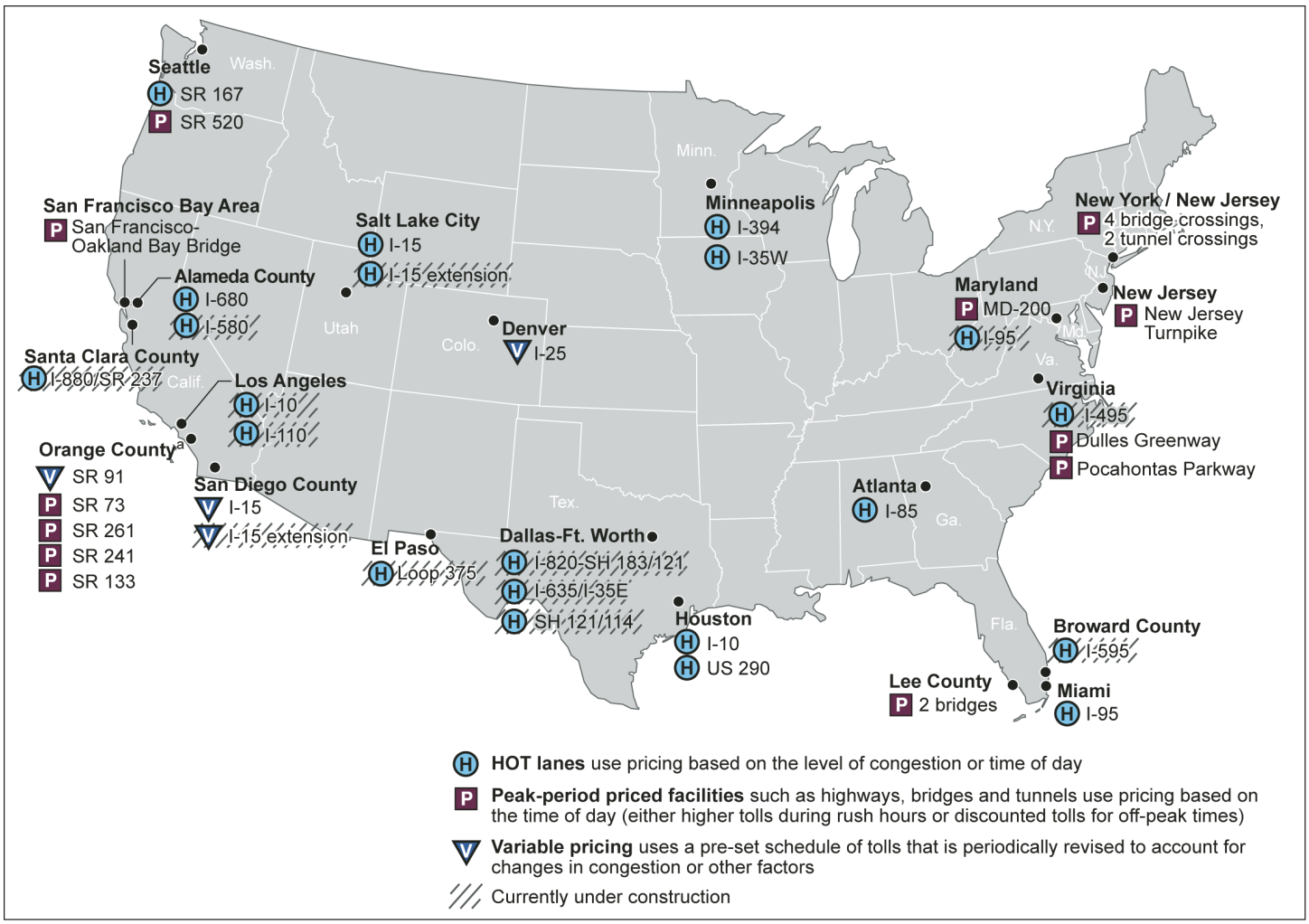
[1]GAO, *Reducing Congestion: Congestion Pricing Has Promise for Improving Use of Transportation Infrastructure*, GAO-03-735T (Washington, D.C.: May 6, 2003); and *Surface Transportation: Strategies Are Available for Making Existing Road Infrastructure Perform Better*, GAO-07-920 (Washington, D.C.: July 26, 2007).

"dynamic" pricing—that is, increasing or decreasing tolls in real time depending on traffic in the HOT lane. Peak-period pricing on already tolled highways, bridges, and tunnels or on new or planned replacement facilities is another type of congestion pricing project in the United States. In this type of pricing, tolls are fixed higher during peak travel times and lower during off-peak times to encourage drivers to use the roadway off-peak. Three HOT lane projects have used a hybrid approach to dynamic and peak-period pricing called "variable" pricing. Variable pricing uses a pre-set schedule of tolls that is periodically revised to account for changes in congestion or other factors.

Since the first U.S. congestion pricing project was implemented in Orange County, California, in 1995, 19 project sponsors have initiated 41 pricing projects on highways, bridges, and tunnels. Projects operate in Georgia, Utah, Colorado, Maryland, and New Jersey with multiple projects in California, Florida, New York, Texas, Virginia, Minnesota, and Washington State. Of the 41 pricing projects, 30 are completed and open to traffic. The 30 opened projects include 12 HOT lane projects and 18 peak-period priced facilities, covering about 400 miles of priced lanes. Projects range in length from 4.1 miles on the State Route (SR) 133 in Orange County, California, to nearly 150 miles on the New Jersey Turnpike,[2] and charge tolls varying from 25 cents to $14. Eleven HOT lane projects are under construction; in addition, 2 of the 12 HOT lane projects in operation are extending the length of their tolled lanes. Figure 1 shows congestion pricing projects in operation and under construction including extensions to existing projects. Appendix II provides additional details on congestion pricing projects and toll rates.

[2]The New Jersey Turnpike discontinued off-peak discounts to out-of-state vehicles as of July 2011.

Figure 1: U.S. Congestion Pricing Projects in Operation or Under Construction



Sources: GAO analysis of US DOT, state departments of transportation, and local authorities information; and Map Resources (base map).

More metropolitan areas across the country are using or plan to use pricing as a way to relieve congestion on highways and bridges, and some regions are planning to implement networks of HOT lanes. Dallas-Ft. Worth, Atlanta, Minneapolis-St. Paul, Seattle, and the San Francisco Bay Area have networks of HOT lanes in their long-term plans. For example, the Metropolitan Transportation Commission of the San Francisco Bay Area proposes to add a 570-mile HOT lane network by 2025 as part of its 35-year regional plan. The Washington State Department of Transportation proposes to convert carpool lanes to HOT lanes on nearly 300 miles in the Seattle/Puget Sound area. Such

networks are also being considered in Los Angeles, Washington, D.C., and the Miami-Ft. Lauderdale area.

Congestion pricing has raised equity concerns among the public and elected officials. In general, an analysis of equity issues examines how costs and benefits of projects are distributed among members of society. In the transportation economics literature, four concepts of equity are cited.

- The extent to which members of the same group are treated equally; for example, whether some people with the same income pay a larger amount in taxes or fees.

- The extent to which those who benefit from a project, such as a new lane, pay for those benefits; for example, is the lane paid for by a toll on users or by a state sales tax paid in part by persons who may not use or benefit from the lane?

- How the costs and benefits of a project are distributed across members of different groups such as high- and low-income people; for example, whether all groups pay in proportion to their income or whether low-income people pay proportionally more of their income for tolls than high-income people.

- The extent to which those who impose social costs bear those costs; for example, whether polluters or drivers on crowded highways pay the full social cost of their driving, or, if a toll causes diversion from the tolled highway to adjacent neighborhoods, those neighborhoods incur the costs of pollution and crowding.

While recognizing that all of these concepts of equity cited in the literature may be important, public and elected officials' concerns regarding congestion pricing have been primarily with the latter two concepts of equity, in particular, what is termed income equity and geographic equity.

- Income equity refers to whether the costs of congestion pricing that users incur are proportional to their incomes, or whether low-income drivers are disproportionately affected. For example, low-income drivers may spend a greater proportion of their income to pay to travel at preferred times or incur greater costs in travel time by choosing alternate unpriced routes. High-income drivers, who, economists generally believe, place a higher value on their time, may be more likely to pay the toll and benefit from a faster trip than low-income drivers, thus possibly generating income equity concerns.

- Geographic equity refers to how equally the costs and benefits associated with congestion pricing are distributed within an affected metropolitan area. For example, if one corridor in a metropolitan area has congestion pricing and another does not, drivers in the tolled corridor may incur greater costs than drivers in the untolled corridor because of the tolls they pay or the increase in travel time they incur by choosing an alternate route. Furthermore, drivers who choose to avoid the tolls and take an alternate route may contribute to congestion on the alternate route. Such diversion of traffic from tolled routes within a corridor can reduce the performance of the alternate untolled routes and negatively affect surrounding neighborhoods. Issues of equity are further complicated if this traffic is diverted through low-income and minority communities.

The transportation economics literature also suggests that the equity impacts of congestion pricing be assessed in comparison to alternatives—namely the predominant sources of funding roadways, such as motor fuel and sales taxes. Comparing these sources could address whether those who benefit from a project, such as a new lane, pay for those benefits; for example, is the lane paid for by users of the facility or by persons who may not use or benefit from the lane? According to the Transportation Research Board, it may be the case that tolling and pricing provide a more equitable means of funding roadways than these other alternatives.[3] We have reported that tolling is consistent with the "user pay" principle because tolling a particular road and using the tolls collected to build and maintain that road more closely link the costs with the distribution of the benefits that users derive from it.[4]

[3]The Transportation Research Board is part of the National Research Council and provides expert advice on transportation policy and programs through task forces, committees, and conferences among other activities. The board has reported that existing transportation funding mechanisms such as sales taxes are not inherently equitable because they can result in poorer households paying a larger share of their income than wealthier households, are required by nonusers and users of the system alike, and make no distinction between occasional or heavy users of the system. Thus, sales taxes are less equitable than fuel taxes and tolls, which are paid by users of the system based on their use. *Transportation Research Board of the National Academies*, "Equity of Evolving Transportation Finance Mechanisms," Washington, D.C.: November 2011.

[4]GAO, *Highway Finance: States' Expanding Use of Tolling Illustrates Diverse Challenges and Strategies,* GAO-06-554 (Washington, D.C.: June 28, 2006).

As a general rule, charging tolls on highways constructed with federal funds is prohibited.[5] However, Congress has enacted several exceptions that authorize DOT to permit tolling in certain instances.

DOT Helps Facilitate Congestion Pricing through Project Approvals and Funding for Implementation, Monitoring, and Evaluation

DOT approves all congestion pricing projects on any roadway that receives federal funds. DOT approval grants the project sponsor permission to have congestion pricing on newly constructed roadways[6] and lanes and converted HOV lanes through three programs. DOT also approves design exceptions and environmental reviews that allow for pricing on federally funded roads. DOT awarded funding to study, implement, and evaluate congestion pricing projects and DOT programs require monitoring and evaluation of pricing projects, although the level of detail varies by program. When applicable, DOT oversees projects and certifies that program performance standards have been met.

DOT Approves Tolling, Project Design Exceptions, and Environmental Reviews on Federally Funded Highways

Congress has authorized DOT to approve tolling, which can include congestion pricing, through three programs.[7] Table 1 provides a summary of the three DOT congestion pricing programs and number of operational or under construction congestion pricing projects authorized under each program.

[5]23 U.S.C. § 301.

[6]SR 520 in Seattle is tolling the existing bridge to fund a replacement bridge.

[7]DOT also provides tolling authority through three other programs—the Section 129 General Tolling program, the Interstate System Reconstruction and Rehabilitation Toll Pilot Program, and the Interstate System Construction Toll Pilot Program—that are focused on using toll revenues to pay for highway construction projects. While tolls may be set in such a way as to manage congestion under these programs, this is not a requirement.

Table 1: DOT Congestion Pricing Programs and Number of Operational or Under Construction Congestion Pricing Projects Authorized Under Each Program

- Value Pricing Pilot Program (VPPP), authorized in the Transportation Equity Act for the 21st Century in 1998 (and preceded by the Congestion Pricing Pilot Program authorized in the Intermodal Surface Transportation Efficiency Act of 1991) is a pilot program for local transportation programs to determine the potential of different value pricing approaches to manage congestion, including projects that would use tolls on highway facilities. DOT can grant tolling authority to 15 state and local transportation agencies for this program. All but 1 of the HOT lane projects in operation and open to traffic and most peak-period pricing projects in the United States received VPPP funds at one time or another.
- Express Lanes Demonstration Program (ELD), authorized in Safe, Accountable, Flexible, Efficient Transportation Equity Act—A Legacy for Users (SAFETEA-LU) in 2005, allows 15 demonstration projects to use tolling to manage high congestion levels, reduce emissions to meet specific Clean Air Act requirements, or finance additional Interstate lanes to reduce congestion. Five projects—4 of which are in Dallas-Ft. Worth, Texas, and the other in Ft. Lauderdale, Florida—have received tolling authority through this program, and 4 of these projects are under construction.
- High Occupancy Vehicle (HOV) Facilities (HOT Lanes), authorized in SAFETEA-LU in 2005, permits states to charge tolls to vehicles that do not meet occupancy requirements to use an HOV lane even if the lane is on an Interstate facility. Eleven of the 12 operational HOT lane projects in the United States received tolling authority as part of the HOV Facilities program or VPPP and its predecessor—the Congestion Pricing Pilot Program.

Source: FHWA.

DOT has also approved design exceptions for certain highway projects that include congestion pricing. DOT has approved exceptions to highway standards to allow for changes to highways to increase capacity within the existing right of way or “footprint.” The Florida Department of Transportation received design exceptions for I-95 in Miami to convert parts of the median and shoulder lanes and to narrow other lanes from the standard 12 feet to 11 feet to make two HOT lanes in each direction. The Minnesota Department of Transportation has received design exceptions to convert shoulder lanes for electronic tolling and bus service during peak periods on I-35W in Minneapolis. This lane also serves as a HOT lane for solo drivers who pay a toll during the same period. The Minnesota Department of Transportation’s design exceptions included changes in lane width and shoulder width as well as advisory speed limits.

In accordance with the National Environmental Policy Act of 1969, as amended (NEPA)[8] and its implementing regulations as well as Executive Order 12898, DOT reviews projects to assess their anticipated environmental and socioeconomic impacts and to determine their need for any additional reviews. Projects that are deemed to have significant environmental impacts must prepare an Environmental Impact Statement.[9] When it is unclear whether or not a significant environmental impact will occur as a result of the project's impacts, an Environmental Assessment must be prepared. Environmental impacts may include effects on air, noise, water quality, wildlife, and wetlands. Additionally, projects may be required to undergo an environmental justice assessment to determine its impacts on low-income and minority populations.[10] Projects that a federal agency has previously determined to have no significant environmental impacts may receive a categorical exclusion, meaning that they do not have to complete an Environmental Impact Statement or Environmental Assessment to comply with NEPA.[11] DOT has approved categorical exclusions for congestion pricing projects that do not lead directly to construction and changes in the facility's "footprint" in accordance with NEPA implementing regulations, along with projects that include new electronics and communications systems for tolling. According to project sponsors that we interviewed, pricing projects that have not changed a facility's "footprint," such as HOV to HOT lane conversions or peak-period pricing on already tolled highways, bridges, and tunnels, have received categorical exclusions. In addition, projects that have narrowed the width of lanes and converted medians and shoulder lanes that have not involved changing the "footprint" of the highway have received categorical exclusions.

[8]Pub. L. No. 91-190, 83 Stat. 852 (Jan. 1, 1970).

[9]23 C.F.R. § 771.115.

[10]Executive Order 12898 directs agencies to identify and address "disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations…" Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, 59 Fed. Reg. 7629 (Feb. 16, 1994).

[11]According to DOT regulations, a categorical exclusion can be granted where actions: "do not induce significant impacts to planned growth or land use for the area; do not require the relocation of significant numbers of people; do not have a significant impact on any natural, cultural, recreational, historic or other resource; do not involve significant air, noise, or water quality impacts; do not have significant impacts on travel patterns; or do not otherwise, either individually or cumulatively, have any significant environmental impacts." 23 C.F.R. 771.117(a).

DOT Has Provided Funds for Studies, Implementation, and Evaluations of Congestion Pricing Projects

DOT has provided funds to promote congestion pricing through several programs that involve tolling—the Urban Partnership Agreement (UPA) and Congestion Reduction Demonstration (CRD) programs and the Value Pricing Pilot Program (VPPP). UPA and CRD, the largest programs that involve tolling, advance congestion pricing through funding awards from 10 separate grant programs.[12] As part of one-time initiatives, the UPA and CRD participants—Seattle, Washington; San Francisco, California; Minneapolis-St. Paul, Minnesota; Miami-Ft. Lauderdale, Florida; Los Angeles, California; and Atlanta, Georgia—were provided approximately $800 million through grant programs to implement tolling as well as transit, technology, and telecommunications strategies to reduce congestion. Funds have been used to build new HOT lanes, convert HOV lanes to HOT lanes, establish electronic tolling systems, and purchase buses for express bus service on HOT lanes.

In addition, DOT has provided about $100 million in grants for studies, implementation, and some evaluations of congestion pricing projects through VPPP since it was established in fiscal year 1998. Nearly all congestion pricing projects in operation have received VPPP funds at one time or another for these purposes. About a third of total VPPP grants were awarded to fund three of the six UPA participants—Seattle in fiscal year 2007 and Minnesota and San Francisco in fiscal year 2008.[13] Before that, Congress authorized $11 million in fiscal year 2005 and $12 million per year for fiscal years 2006 through 2009 for projects that involve highway pricing, of which $3 million per year was set aside for nontolling projects, such as parking and car sharing projects. See appendix III for a list of VPPP grants and activities from fiscal years 1999 through 2010.

[12]The UPA and CRD programs gave priority consideration to participants applying for discretionary grants from DOT's Federal Highway Administration's Value Pricing Pilot Program; Interstate Maintenance Discretionary; Transportation, Community and System Preservation; Innovative Research and Bridge Deployment Program; Ferry Boat Discretionary; and Public Lands Highways programs. Funds are also used from the Federal Transit Administration's Bus and Bus Facilities and Alternative Analysis programs; as well as Research and Innovative Technology Administration's Intelligent Transportation Systems and Intelligent Transportation Systems Operational Testing to Mitigate Congestion programs. Funds go to project elements that must meet eligibility criteria for their respective grant program.

[13]San Francisco's SFPark uses congestion pricing by adjusting parking meter and garage prices up or down based on the demand for parking. Drivers can receive real-time information about where parking is available and at which price using personal mobile devices such as iPhones. This "demand-responsive" pricing encourages drivers to park in underused areas and garages, reducing demand for parking in overused areas.

VPPP funds have been used to:

- **Study the potential of pricing in a corridor or region or the feasibility of a particular pricing project.** Studies have examined the benefits of implementing variable pricing on an already tolled facility such as the Florida Turnpike in Miami-Dade County and the Pennsylvania Turnpike near Pittsburgh and Philadelphia. VPPP-funded studies have also examined the feasibility of extending HOT Lanes such as I-15 in San Diego, California.

- **Implement elements of projects.** Lee County, Florida, used a grant to purchase transponder readers for electronic tolling on two of its bridges. The Washington State Department of Transportation used VPPP funds to install electronic tolling technology on the SR 520 bridge that determine changes in tolls based on congestion.

- **Evaluate specific projects.** Evaluations studied the results and challenges of implementing pricing projects including SR 91 in Orange County, California; I-15 in San Diego; California; I-394 in Minneapolis, Minnesota; and I-10 and U.S. 290 in Houston, Texas.

In addition to the funding provided through VPPP, federal funding is available for congestion pricing projects through other programs. For example, federal credit assistance available under the Transportation Infrastructure Finance and Innovation Act program has been used to help finance construction of HOT lanes for 7 projects including those on I-495 in Virginia, I-635/I-35E in Texas, and I-595 in Florida.[14] In addition, states receive nearly $40 billion a year in federal funding for highways through a series of grant programs collectively known as the Federal-Aid Highway Program. These grant programs have also been used to help finance the construction of congestion pricing projects.

[14]The Transportation Infrastructure Finance and Innovation Act program provides federal credit assistance in the form of direct loans, loan guarantees, and standby lines of credit to finance eligible surface transportation projects of national and regional significance.

DOT Requires Performance Monitoring for All Its Toll Programs and Compliance with Performance Standard for Its HOV Facilities Program

The HOV Facilities program requires project sponsors to annually monitor and report HOT lane traffic speeds and is the only DOT tolling program that requires project sponsors to meet an annual performance standard. In the case of an HOV facility with a speed limit greater than 50 miles per hour, vehicles must be able to travel at least 45 miles per hour 90 percent of the time during weekday morning and evening peak hours over a 180-day period.[15] If this standard is not met, the road operator must make changes to bring the facility back into compliance. Such changes could include raising tolls on paying cars or changing carpooling requirements to achieve the standard. DOT established this speed requirement because HOV lanes, by law, are transit "fixed guideway" facilities that encourage transit use and thus traffic must maintain speeds compatible with express bus service. Nearly all HOV to HOT lane conversions in operation have been authorized under either the HOV Facilities program or VPPP (and its predecessor, the Congestion Pricing Pilot Program). Projects that were authorized under HOV Facilities have this performance requirement. DOT monitors the reported performance of HOT lanes authorized under the HOV Facilities program. According to DOT officials, there has not been a case in which a HOT lane has not met the standard.

For the Express Lanes Demonstration (ELD) program, project sponsors monitor and evaluate their projects' performance and are required to report annually to DOT. DOT then reports to Congress on the performance of the ELD projects. Performance goals are in four categories—(1) travel, traffic, and air quality; (2) distribution of benefits and burdens on users of the facility; (3) use of alternative transportation modes; and (4) use of revenue to meet transportation or impact mitigation needs.[16] Performance measures include changes in traffic volumes and traffic speed; average tolls charged for the year compared with the previous year; number of carpools and express bus ridership; and use of toll revenues, including the percentage of revenues used to mitigate impacts. Unlike HOV Facilities program projects, ELD program projects are not required by statute to meet specific performance standards. Because four of the five existing ELD projects are currently under

[15]Pub. L. No. 109-59, § 1121(d) (Aug. 5, 2005). In the case of an HOV facility with a speed limit of less than 50 miles per hour, the minimum operating speed must not be more than 10 miles per hour below the speed limit.

[16]Pub. L. No. 109-59, § 1604(b)(7)(A).

construction and construction has not begun on the fifth, no performance reporting for completed ELD projects currently exists.

DOT also requires project sponsors that receive VPPP funds to monitor and evaluate the performance of their projects so that the agency can report results biannually to Congress as required by statute.[17] Project sponsors report five categories of effects—(1) driver behavior, traffic volumes, and travel speeds; (2) transit ridership; (3) air quality; (4) equity for low-income individuals; and (5) availability of funds for transportation programs. As with the ELD program, projects that receive VPPP grants are not required to meet specific performance standards.

Under the UPA and CRD programs, DOT has provided funds to the Battelle Memorial Institute to conduct an independent national evaluation of the effectiveness of the program's four congestion reduction strategies—tolling, transit, technology, and telecommuting. Projects will be assessed individually and results compared across all projects in the six metropolitan areas according to specific metrics. These metrics include reductions in congestion delay and duration; increases in the number of cars and people in cars (i.e., vehicle and passenger throughput), and shifts to travel during off-peak times, among other factors.[18]

See appendix IV for list of performance and monitoring requirements for federal programs for congestion pricing projects.

[17]Pub. L. No. 102-240, § 1012(b)(5), 105 Stat. 1914 (Dec. 18, 1991), as amended by Pub. L. No. 109-59, § 1604.

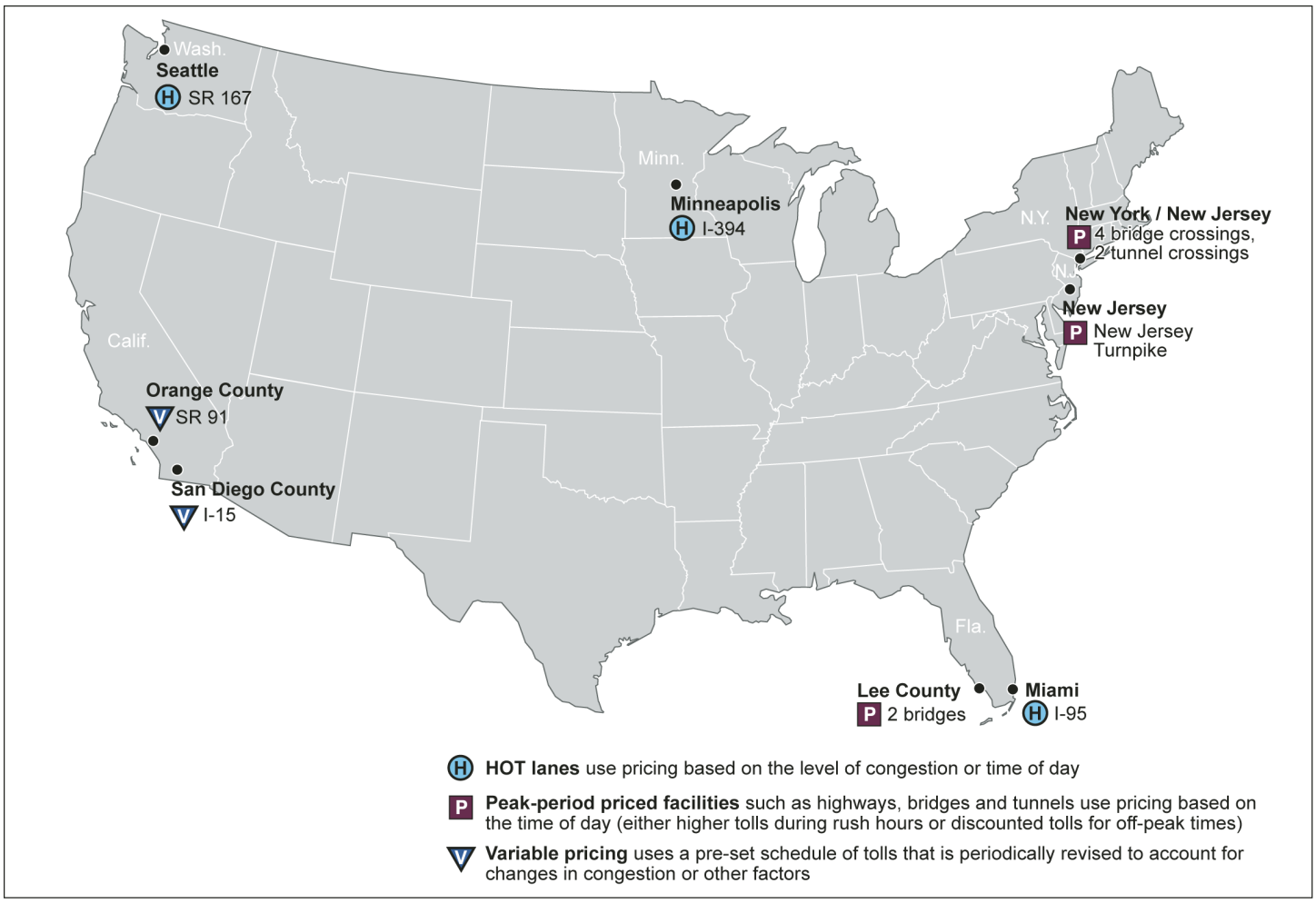
[18]*Urban Partnership Agreement and Congestion Reduction Demonstration: National Evaluation Framework,* U.S. Department of Transportation, Washington, D.C.: November 21, 2008.

Project Evaluations Have Generally Shown Reduced Congestion, but Other Effects Have Not Been Consistently Assessed

Evaluations of 14 congestion pricing projects in the United States have generally shown reduced congestion, although other results are mixed, and not all possible relevant effects have been assessed. HOT lane projects, which aim to improve the flow of traffic and throughput with increased speeds and decreased travel times, have reduced congestion by increasing vehicle throughput, and have generally shown reduced congestion, increased speeds, and decreased travel times in the priced and unpriced lanes. Some HOT lane projects have added new lanes and thus, for these projects, the effects of pricing on performance have not been distinguished from the effects of the added lane. In addition, although the number of cars using HOT lanes has risen, there were fewer people in the cars—a fact attributed to an increase in the share of toll-paying solo drivers or a decrease in carpooling on HOT lanes. Peak-period pricing projects that aim to reduce congestion by encouraging drivers to travel at off-peak times have shifted some drivers to travel during those times. Other effects of congestion pricing projects, such as equity income impacts, have not always been evaluated. Evaluating these impacts is important to address public and elected officials' concerns about the effects of pricing on travelers and communities. Not evaluating these effects leads to an incomplete understanding of the full effects of pricing.

Of the project sponsors that have operational congestion pricing, 8 have a current and completed evaluation of at least one of their projects, for a total of 14 evaluated projects. These eight evaluations assess five HOT lane projects and nine peak-period pricing projects, as shown in figure 2. For a description of our objectives, scope, and methodology in analyzing the congestion pricing projects, see appendix I.

Figure 2: Project Sponsors That Have Current and Completed Evaluations of Congestion Pricing Projects



Sources: GAO analysis of US DOT, state departments of transportation, and local authorities information; and Map Resources (base map).

Because of differences in project objectives and in DOT's monitoring and evaluation requirements, the completed evaluations vary in which aspects of performance they report. No evaluation has assessed the performance of congestion pricing across projects. In addition, the evaluations represent an assessment of the results of the projects at specific points in time. Were the evaluations on-going or repeated at different time intervals, it is possible that the results would differ. The most common measures used across the evaluations have been travel time and speed, throughput, off-peak travel, transit ridership, and equity. Table 2 lists and

defines these five common performance measures and definitions used in congestion pricing project evaluations.

Table 2: Five Common Performance Measures and Definitions Used in Current and Completed Congestion Pricing Project Evaluations

Performance measure	Definitions
Travel time and speed	How fast vehicles travel and how long it takes for the vehicles to drive from one end of the HOT lane to the other.
Throughput	How many vehicles move through the HOT lanes and/or the corridor (vehicle throughput).
	How many people move through the HOT lanes and/or the corridor (passenger throughput).
	The average number of people in a vehicle (buses and cars) on the HOT lanes and/or in the corridor (average vehicle occupancy).
Off-peak travel	Whether drivers change their behavior to travel during off-peak times.
Transit ridership	Whether drivers change their behavior to take transit.
Equity	Income Equity: How the distribution of benefits from tolling are spread among commuters of all incomes in the corridor.
	Geographic Equity: Whether drivers change their behavior to drive on alternative unpriced roadways within the same corridor as the priced roadway.

Source: GAO analysis of performance measures and definitions used in the assessed project evaluations.

Projects Improved Performance in Certain Areas According to Certain Measures, but Results for Other Measures Were Mixed and Varied by Project Type

Travel Time and Speed

Evaluations of HOT lane projects, which are designed to improve travel time and speed, have shown improvements. Both travel time and travel speed improved on at least some sections of all five HOT lane projects that were evaluated. Sometimes the improved travel times in the HOT lanes also led to improved travel times in the adjacent unpriced lanes because solo drivers paid to switch to the HOT lanes. For example, on SR 167 in Seattle, peak-hour travel speeds on the adjacent unpriced lanes increased as much as 19 percent compared with travel speeds in 2007 while speeds on the HOT lanes remained about the same,

averaging the speed limit of 60 miles per hour.[19] According to the evaluation of I-15 in San Diego, drivers in the HOT lanes reportedly saved up to 20 minutes more than drivers in the adjacent unpriced lanes during the most congested times. Neither project included a new lane. Two other HOT lane projects—on I-95 in Miami and SR 91 in Orange County — included two new lanes in each direction, which also helped improve travel times and speed. On I-95, for example, which Florida Department of Transportation officials identified as the most heavily congested highway in the state before pricing began in 2008, the evaluation reported that drivers have reportedly saved about 14 minutes in the HOT lanes and 11 minutes in the adjacent unpriced lanes per trip. Evaluations of the I-95 and SR 91 projects did not, however, isolate the effects of the added lane and pricing on performance. Isolating such effects is challenging because even if a study accounts for the increased vehicle throughput on the new lanes, it may then understate the throughput the other lanes could have handled if the new lanes had not been added.

Evaluations of the nine peak-period pricing projects with completed evaluations reported no effects on travel time and speed. Two of these evaluations—of the New Jersey Turnpike and Lee County bridges—analyzed these effects. Although travel times on the New Jersey Turnpike improved from 2000 to 2001 when electronic tolling and peak-period pricing were introduced at the same time, the project evaluation attributed the improvement mostly to electronic tolling and not to pricing.

Traffic Throughput

Evaluations of all five HOT lane projects reported an increase in vehicle throughput—as measured by traffic volumes—on the HOT lanes and sometimes on the adjacent unpriced lanes and attributed this increase to both congestion pricing and the addition of new lanes. For example, according to a 2006 evaluation of the I-394 project in Minneapolis, vehicle throughput in the HOT lanes increased by 9 to 13 percent and by 5 percent in the adjacent unpriced lanes after the lanes opened. A 2000 evaluation of the SR 91 project in Orange County estimated that vehicle throughput increased 21 percent on the entire roadway.

[19]The performance evaluation for SR 167 did not report the specific speeds for before and after implementation. It only reported the percentage increase between them. A graphic in the evaluation shows the increase from around 40 miles per hour in 2007 to about 50 miles per hour in 2010 for the adjacent unpriced lanes while the HOT lanes stayed the same at 60 miles per hour.

Four of the five HOT lane project evaluations that tracked the average number of people in a car (known as average vehicle occupancy) showed a decrease in the number of passengers per car. Thus, while there were more cars using the HOT lanes, there were, on average, fewer people in the cars, which project sponsors attributed to an increase of the share of toll-paying solo drivers or a decrease in carpooling in the HOT lanes. In addition, evaluations of two projects assessed passenger throughput which takes into account the number of people riding buses as well as the average vehicle occupancy rate to estimate the total number of people moved through the roadway. According to the evaluations, passenger throughput on I-15 in San Diego increased slightly between 1997 and 1998, and then decreased between 1998 and 1999, and passenger throughput on I-95 in Miami increased 42 percent between 2008 and 2010 on the HOT lanes—a result the evaluation attributed to an increase in toll-paying solo drivers, transit ridership, and the addition of two HOT lanes.

Evaluations of peak-period pricing projects found no increase in throughput due to congestion pricing. Specifically, evaluations of the New Jersey Turnpike and Lee County bridges assessed the impact of pricing on traffic volume and found no changes in vehicle throughput or average vehicle occupancy due to pricing that differed from overall traffic trends.

Encouraging a Shift to Off-Peak Travel

To evaluate two of the five HOT lane projects—I-15 in San Diego and SR 91 in Orange County—project sponsors surveyed drivers to determine whether they changed their trips to travel at off-peak times. According to the I-15 survey results, some traffic shifted from the middle of the peak rush hour to the “peak-shoulder” times—the times directly before and after peak periods. However, the sponsors did not explain why this shift occurred. Drivers surveyed for the SR 91 evaluation said that the level of congestion affected their travel time decisions more than the presence of the toll. Project sponsors that did not study shifts to off-peak travel times said they did not do so because, in one case, the sponsor did not see the HOT lanes as offering incentives that would encourage peak-period travelers to shift their travel to off-peak periods, and, in another case, the sponsor was not required to study shifts to off-peak travel but would consider doing so in the future.

Sponsors of peak-period pricing projects conducted more robust studies of off-peak travel because it was a more explicit goal of their projects. These studies showed some success in reducing congestion during peak times. Evaluations for two of the three peak-period pricing projects showed that drivers chose to take trips at off-peak times on highways,

bridges, and tunnels to take advantage of discounted tolls. For example, according to a 2005 performance evaluation of traffic on bridges and tunnels into New York City conducted by the City University of New York for the Port Authority of New York and New Jersey, car and truck traffic increased in off-peak periods for most crossings.[20] The evaluation reported more significant improvements in the morning before the peak periods than after the peak periods at the end of the day, which the evaluation attributed to drivers finding it easier to arrive at work early than to arrive at work later. According to this survey, a majority of drivers had little flexibility to change their schedule to travel at off-peak times. For example, truck drivers said that they could not adjust their delivery schedules to travel at off-peak times. Furthermore, drivers said that the toll difference of $1 was not great enough to influence them to change their travel time. Despite this, a significant minority could alter their travel departure times between 30 minutes and 2 hours. Thirty-five of the 505 surveyed drivers representing 7.4 percent of passenger trips said that they changed their travel behavior as a result of the project. According to the Port Authority, the 7.4 percent change in passenger trips to off-peak times is significant, since small changes can have exponential effects because of traffic queuing.

An evaluation of peak-period pricing on the New Jersey Turnpike based on a driver survey found that work schedules or a desire to avoid traffic created a greater incentive for determining when to travel than a slightly lower toll for off-peak travel. Thus, it appears that drivers chose to travel at off-peak times because of congestion and not because of modest differences in price.

Changes in Transit Ridership

Evaluations of four of the five HOT lane projects assessed changes in transit ridership, but results were mixed. I-95 in Miami was the only one with demonstrated increases in transit ridership. Between 2008 and 2010, the average weekday ridership on the I-95 express bus increased by 57 percent, from about 1,800 riders in 2008 to more than 2,800 in 2010. About 38 percent of these riders reported in a transit rider survey that

[20]While the performance evaluation for the Port Authority crossings did not report the specific increases and decreases in traffic, it reported and measured the statistical significance of these changes. The evaluation stated that results indicated statistically significant increases in the percent share of off-peak period car and truck traffic for most crossings. Morning pre-peak increases were significant on more crossings than post-peak increases. Peak-period truck traffic decreased significantly on all crossings. Car traffic also decreased for peak-period crossings, but these results were not statistically significant.

they used to drive alone. The other three HOT lane project evaluations found no increase in transit ridership on buses using the HOT lanes as a result of the project. While transit ridership reportedly increased on I-15 in San Diego, the evaluation stated that this increase was not linked to the project. Evaluations of all three peak-period pricing projects assessed whether drivers shifted to transit, but none found evidence of any changes in transit ridership.[21]

Equity

Many efforts have been made to assess the effects of congestion pricing projects on equity, including income equity (the distribution of costs and benefits of congestion pricing between low- and high-income drivers) and geographic equity (the relative effects of congestion pricing on two geographic areas, including the effects of any traffic diversion). Three of the eight evaluations, covering one HOT lane project and three peak-period projects, attempted to assess both income and geographic equity, and none attempted to assess other effects on equity, such as whether members of the same group are treated differently or to what extent the beneficiaries of a project, such as a new lane, pay for those benefits.

Income Equity

Evaluations for four of the five HOT lane projects attempted to assess equity through surveys or focus groups of travelers concerning their use of congestion pricing projects; however, different elements of equity were evaluated. For example, three of the four HOT lane project evaluations that assessed equity did so by considering the effects of congestion pricing on drivers of different income levels. Results for these three projects—SR 91 in Orange County, I-394 in Minneapolis, and SR 167 in Seattle—indicated that drivers of all incomes used the HOT lanes, but high-income drivers used them more often than low-income drivers.[22] In addition, evaluations for all four HOT lane projects—SR 91 in Orange County, I-394 in Minneapolis, SR 167 in Seattle, and I-15 in San Diego—found that drivers liked having the option of using the HOT lanes and thus were supportive of them. The fifth HOT lane project—I-95 in Miami—has not undergone an assessment of the effect of congestion pricing on low-

[21]Many factors determine whether a driver will shift to transit including availability and accessibility of transit options. While transit was available in the locations studied, we did not independently determine the robustness of that service during the time that the evaluation was conducted.

[22]The definitions of low- and high-income populations varied by study.

income drivers because, according to the project sponsor, the benefits of congestion pricing—including increased travel speeds—accrue to all users.

Evaluations of the nine peak-period pricing projects considered different elements of equity and found few impacts. However, all three projects were previously tolled and toll discounts were offered for travel at off-peak times. Thus, no tolls, including those for peak periods, were raised. The New Jersey Turnpike Authority evaluated the income and ethnicity of those who shifted to the off-peak times, while the Lee County Department of Transportation assessed the age, gender, and work schedules of those who shifted to the off-peak times. Both project sponsors also surveyed drivers, who said they thought the off-peak discounts were equitable and the pricing program fair. However, the sample sizes for both these surveys were small; thus, the results may not provide reliable estimates for the various subgroups they measured.

Geographic Equity

Evaluating geographic equity—or the effects of any traffic diverted from HOT lanes or from peak-period priced highways, bridges and tunnels onto unpriced lanes and roads—would provide decision makers with information about potential negative effects, such as whether traffic on the unpriced alternatives increased. The sponsor of one of the five HOT lanes projects—SR 91 in Orange County—studied diversion and reported that traffic was drawn to the roadway and its HOT lanes because the priced lanes were new and added capacity. Sponsors of the other four HOT lane projects did not evaluate traffic diversion for several reasons, according to the sponsors. First, drivers can choose to drive in the unpriced lanes and none of the projects took away an unpriced lane—only HOV lanes were converted. Furthermore, two of the HOT lane projects added a lane to the roadway and allowed solo drivers to use a previously underused HOV lane. As a result, the sponsors said they expected drivers to be diverted to the HOT lanes, not away from them. Second, even if they had anticipated traffic diversion to alternative roads, the sponsors said they would not have surveyed drivers or asked them to maintain travel diaries because these methods were expensive and challenging to implement. They added that electronic data collection methods, such as GPS tracking in vehicles, transponder tracking, and license plate tracking, can be expensive and raise privacy issues.

Two peak-period pricing project sponsors—the New Jersey Turnpike Authority and the Lee County Department of Transportation—studied

traffic diversion to adjacent unpriced roads and found no evidence of diversion. According to the studies, such diversion would not be likely for these roadways because there are no comparable alternative routes.[23] Furthermore, the projects were previously tolled and congestion pricing was implemented with off-peak discounts. As for the HOT lane projects, traffic diversion may be less of a concern if a highway, bridge, or tunnel was previously priced than if it was previously unpriced.

Other Equity and Environmental Concerns

Sponsors of one HOT lane project—SR 167 in Seattle—and one peak-period pricing project—the New Jersey Turnpike—evaluated the impact of pricing on minorities. An environmental justice assessment for SR 167 found that there would not be a disproportionate effect on minorities because there was a small minority population in the area, the project was limited to 9 miles southbound and 11 miles northbound, and there were unpriced alternatives—adjacent lanes and roads—that could be used.[24] The 2005 New Jersey Turnpike evaluation found that there would be no disproportionate effect on minority populations; however, as mentioned before, the survey sample size was small and therefore its results cannot be generalized to all users.

Evaluations of three HOT lane projects—I-15 in San Diego, SR 91 in Orange County, and I-394 in Minneapolis—and one peak-period pricing project—the New Jersey Turnpike—assessed environmental effects. All four evaluations assessed the impacts of pricing on air quality, and one HOT lane project—I-394—also assessed noise impacts. The air quality assessments, designed to test whether air quality improved as experts said it could with fewer cars idling in traffic, showed mixed results: minimal air quality improvements were reported on I-15, I-394, and the New Jersey Turnpike, but no effects on SR 91. The noise impact assessment on I-394 found that there would be no significant noise impacts resulting from pricing.

[23]The New Jersey Turnpike parallels I-295 in the southern part of the state and other roadways parallel the turnpike in the northern part of the state, but no roadway runs the entire length of the state to form a parallel alternative route.

[24]*SR 167 HOT Lanes: Social, Economic and Environmental Justice Report*, Washington State Department of Transportation, January 2007.

UPA Evaluations Should Improve Understanding of the Performance and Impacts of Congestion Pricing

The completed performance evaluations provide some information as to the effectiveness of congestion pricing, but the UPA and CRD evaluation framework has the potential to provide decision makers with a more consistent and comprehensive picture of the effects of pricing. The UPA and CRD evaluations which began in 2009 will collect data on UPA and CRD projects in the six metropolitan areas for 1 year before a project is implemented and then for another year after it has been implemented to assess its effects. The evaluation framework will provide standard performance measures such as travel times and vehicle throughput and help develop a more comprehensive study of congestion pricing, including increased monitoring of passenger throughput and socio-economic information of HOT lane users. Performance measures and detailed metrics will be used to assess individual projects and across projects, which has not been consistently done so far. The evaluation framework will also assess the impacts of pricing on low-income drivers and changes in their travel time and distance traveled as a result of pricing. Travel diary surveys will be conducted at two of the UPA sites, which may provide some basis to study equity impacts including whether driver behavior changes based on income, such as diverting traffic to adjacent unpriced roads. In addition, the evaluation framework will include surveys to assess transit ridership for all projects that have a transit element. Despite the potential for greater understanding of the effects of congestion pricing as part of the UPA and CRD evaluation framework, evaluations have only been completed in one of the six metropolitan areas—and this was for its first phase.[25] Thus we cannot assess the evaluation framework or surveys' effectiveness until they are completed. DOT expects to have all of the UPA project evaluations completed by 2014.

[25]The Florida Department of Transportation completed an evaluation of the first phase of its HOT lanes project. The UPA National evaluation team—consisting of the Battelle Memorial Institute, the Texas Transportation Institute, and the Volpe National Transportation Systems Center—coordinated with the Florida Department of Transportation's evaluation. The national evaluation team will conduct the evaluations for the other five localities. The Volpe National Transportation Systems Center is conducting the travel diaries study.

Greater Equity and Safety Issues Might Develop as New Projects Are Implemented

Expanded Use of Pricing Could Raise Equity Concerns

Income and geographic equity concerns may become more prevalent as congestion pricing becomes more widespread. Such concerns could be particularly relevant for HOT lane projects with a potential for large toll increases, such as projects that must meet HOV Facilities program performance requirements to maintain traffic speeds of 45 to 55 miles per hour. Tolls on pricing projects in operation are relatively low, but can be as high as a dollar per mile. Though currently capped, these tolls could be raised if necessary to maintain the required traffic speeds. In turn, higher toll rates could lead to more traffic diversion if drivers chose not to pay for HOT lanes and took adjacent unpriced lanes or roads instead.

These concerns may be particularly acute in the future for projects designed to use pricing not only to manage congestion but also to meet toll revenue targets. SR 520 in Seattle, which began pricing in December 2011, will generate toll revenues to pay for bonds to build a replacement bridge. All cars, including carpools, pay a toll that varies up to $5.00. Registered vanpools, express buses, and emergency vehicles have free use. Because this is the first project to toll a previously untolled bridge and there are parallel alternative routes, traffic diversion may become a concern. According to traffic models from the area's transportation planning council, traffic could increase on the parallel Interstate route by 5 to 8 percent and on an alternative state road by 5 percent. Geographic equity concerns could be minimized by introducing tolling on both the Interstate and state road because drivers on all three routes would then pay a toll and diversion from tolled routes to untolled routes would be less of a concern. However, according to officials in the Seattle metropolitan area, the public and elected officials are opposed to tolling these other routes.

Several other projects under construction involve public-private partnerships that plan to use toll revenues to pay for construction debt, operations, maintenance, and provide a return to private investors. However, meeting revenue targets can be at odds with policies to

increase throughput on highways and bridges by encouraging more people to use carpools and express bus service. According to one expert, project sponsors seeking to maximize revenue could in theory charge a higher toll and make more money off of fewer paying vehicles. Raising revenue could be at odds with managing congestion (e.g., increasing passenger throughput) if higher tolls can produce more revenue from fewer paying vehicles. In addition, as we have previously reported, tolls on roadways operated by private concessionaires can be expected to be higher than on comparable facilities operated by public agencies.[26] Three projects—I-495 in Northern Virginia and the LBJ Express (I-635/I-35E) and North Tarrant Express (I-820-SH 121/183) in Dallas-Ft. Worth—are public-private partnerships in which the private operator sets the toll rate. I-595 project in Broward County, Florida, is also a public-private partnership, but the state department of transportation has retained the authority to set the toll rate.

Greater equity concerns could also be raised as decision makers consider introducing tolling and pricing into previously untolled facilities. For example, the Port Authority of New York and New Jersey is conducting a study to assess the potential for improving throughput by converting an unpriced lane to a HOT lane on the approach to the Lincoln Tunnel during peak periods. Under the proposal, buses and carpools with three or more passengers would continue to have free access, but solo drivers would pay a toll. According to project sponsors, such switching would be positive because it would increase the number of people going through the tunnel at peak times.[27] However, converting an unpriced lane to a priced one does not have much public or political support. According to DOT officials, no pricing project to date has involved the conversion of an unpriced lane to a HOT lane—all projects thus far have involved the

[26]GAO, *Highway Public-Private Partnerships: More Rigorous Up-front Analysis Could Better Secure Potential Benefits and Protect the Public Interest,* GAO-08-44 (Washington, D.C.: Feb. 8, 2008).

[27]In addition, I-95 in Miami has raised its carpool occupancy requirements for free use from two to three passengers. Thus, two-passenger carpools pay a toll to use the HOT lanes or use the adjacent unpriced lanes. According to the Florida Department of Transportation, it has not studied the impact of pricing on two-passenger carpools and therefore does not know how many people have been affected.

conversion of HOV lanes or the addition of new lanes.[28] The SR 520 bridge in Seattle is the only previously unpriced facility to be fully priced. According to experts, pricing existing unpriced lanes and roadways could lead to geographic equity concerns as drivers divert to alternate routes to avoid tolls.

While future pricing projects may raise equity concerns, these concerns should be weighed against the potential benefits, including enhancing economic efficiency, increasing throughput, and reducing congestion. For example, greater use of pricing could enhance economic efficiency by discouraging solo driving and making alternatives such as carpooling or taking transit more appealing, thus resulting in more efficient use of existing roadways. Such changes in drivers' behavior could also improve throughput and reduce congestion. In addition, as previously discussed, the equity impacts of congestion pricing can also be assessed in comparison to the equity concerns raised by the alternatives—namely the prevalent sources of funding roadways such as motor fuel and sales taxes.

A number of options are also available to address equity issues. One such option is to use a portion of toll revenues for alternative transportation modes in the highway corridor, such as express bus service on HOT lanes. In general, bus riders are disproportionately lower-income individuals who would benefit from both reduced congestion on the HOT lanes and increased transit investments from toll revenues. In a survey of Seattle residents, public support for tolling the SR 520 bridge grew substantially if a portion of the toll revenue was dedicated to transit, even if tolls had to be significantly higher to pay for transit service. As part of its UPA program funding, Seattle has received grant funds for new buses to begin service on the SR 520 bridge. Other UPA program participants, including Minnesota and Miami, have received DOT grants for express bus service on HOT lanes. Under the ELD program, Federal law permits the use of excess toll revenue for eligible highway and/or

[28]A proposal to charge a toll for vehicles entering lower Manhattan though supported by the city's mayor and approved by the City Council, was not adopted by the state legislature. This would have been the first project that charged a toll to access an area that was free before, known as cordon pricing.

transit service;[29] however, pricing projects generally have not had excess revenues.[30] Officials with the transportation planning council for the Minneapolis-St. Paul area told us that revenues from the I-394 project have generally not exceeded the project's operational costs and therefore local transit funds are being used, as they were before the project was initiated, to provide express bus service on the HOT lanes. The San Diego Association of Governments also has used bus fare revenue to fund express bus service on I-15 in San Diego because the HOT lanes have not generated enough toll revenues to pay for bus service. In addition to the availability of revenues, the effectiveness of providing revenues to transit to address equity also depends on the availability of transit service and traveler commuting patterns. Transit may not be an option for some travelers given the location of homes, jobs, and other travel destinations.

I-25 in Denver has taken steps to address equity among passengers and drivers on the HOT lanes by setting its peak period toll rate based on the fare charged to express bus passengers on the HOT lanes. Thus, as the fare for express bus passengers increases, the toll rate for drivers to use the HOT lanes also increases.

An additional option to address equity issues would be to use toll revenues to reimburse low-income drivers, whether by exempting them from paying tolls or by providing them with a tax credit for the difference between the toll and transit fares. However, such reimbursement programs would involve complex efforts to determine and verify drivers' low-income status. Nonetheless, some states such as California offer discounted utility rates for eligible households and in these states, transportation agencies have considered whether to use these preexisting mechanisms for eligibility and enforcement to provide discounted toll rates. However, no pricing project has used this option. Some experts have noted that discounts on tolls for low-income drivers would counteract the goal of reducing congestion because the discounts would

[29]Pub. L. No. 109-59, § 1604, at 23 U.S.C. § 129. Depending on the program, the ability to use toll revenue for transit and other such purposes may be limited. The ELD program permits use of excess toll revenue for eligible highway or transit projects after revenues have been used for repayment of debt, reasonable return on investment of any private financing, and maintenance of facility.

[30]According to DOT, I-95 in Miami, SR 91 in Orange County, and I-25 in Denver have generated excess revenues.

encourage continued driving. Instead, they propose charging the same tolls to all users, but returning revenues to affected groups, such as groups of vehicle owners or a class of residents. VPPP federal funds were used to study the potential of providing credits for low-income highway users in Alameda County, California but no pricing project has used this option.

To provide insight on environmental justice issues, DOT approved two VPPP grants for fiscal year 2010-2011 to assess the impacts of pricing on low-income drivers. One grant, for I-30 in Dallas-Ft. Worth is to examine environmental justice issues related to pricing I-30 through the use of Intelligent Transportation Systems technology. According to DOT, "the project is important because it will provide more data on environmental justice and pricing, given that there is little experience with strategies designed to address these issues related to the introduction of pricing." The other grant, for a pricing project in Hartford, Connecticut, is to study the application of pricing and the impacts of environmental justice issues that resulted from the original construction of a project.

Potential Safety Issues May Occur with Pricing Converted Shoulder Lanes and Narrowing Lanes

Many highway projects increase the capacity of a roadway by converting shoulders or narrowing lanes which has the advantage of eliminating the need to widen highway and acquire additional property—of particular advantage in urban areas. Several congestion pricing projects have employed this strategy. For example, the Minnesota Department of Transportation has converted bus-only shoulder lanes on I-35W in Minneapolis to serve as HOT lanes during peak periods and has narrowed traffic lanes from 12 feet to 11 feet. In addition, as previously noted, the Florida Department of Transportation has incorporated portions of its medians and shoulders and narrowed traffic lanes from 12 feet to 11 feet to create two HOT lanes on I-95 in Miami. Moreover, two new projects—Loop 1[31] in Austin and I-94 in Minneapolis—will create new capacity by using shoulders and narrowing traffic lanes. The Loop 1 project will reduce shoulder width and incorporate parts of the shoulders to create an express lane, while the I-94 project may, if implemented, use shoulders and narrowed traffic lanes to create a HOT lane between

[31]Also known as Mopac (Missouri Pacific) Expressway; it is one of two major existing north-south controlled-access highways in the Austin area.

Minneapolis and St. Paul. According to the project sponsor, I-94 does not have the space to build new HOT lanes if shoulders are not incorporated.

Projects that convert shoulders and narrow lanes to create new lanes, including congestion pricing projects, raise concerns about driver safety and highway operations that transportation planners must address. Additional lanes on converted shoulders remove the safety refuge areas for motorists during vehicle breakdowns and emergencies and must be approved by DOT. According to the American Association of State Highway Transportation Officials, highways with paved shoulders have lower accident rates. Paved shoulders provide space to make evasive maneuvers; accommodate driver error; and add a recovery area to regain control of a vehicle, among other things. In addition, an analysis by the Highway Safety Information System[32] sponsored by DOT reported that narrowing lanes or using shoulders to expand urban highways increased accidents by 10 percent. With traffic moving faster in the additional (or HOT) lane and slower in the unpriced lanes, the potential for sideswiping and lane-changing accidents increases. Another study conducted by the Texas Transportation Institute found that maintaining a shoulder and a wider HOV lane than adjacent unpriced lanes can help mitigate safety concerns.[33]

FHWA officials in Florida suggested that some of these safety issues could be mitigated using an incident management system, such as the one the Florida Department of Transportation has used on I-95 since 2008. As a condition of approving several design exceptions, FHWA required the Florida Department of Transportation to implement Intelligent Transportation Systems to mitigate safety issues related to incorporating a shoulder and narrowing lanes on I-95 in Miami. While using an incident management system does not prevent incidents from occurring, cameras can survey highways and detect incidents such as accidents, debris, and stalled vehicles. Highway message signs then convey information to drivers about the incidents and traffic conditions. Florida Department of

[32]The Highway Safety Information System is a multi-state database that contains crash, roadway inventory, and traffic volume data for a select group of states and is managed by the University of North Carolina Highway Safety Research Center under contract with the Federal Highway Administration.

[33]Texas Transportation Institute, *Guidance for Future Design of Freeways with High-Occupancy Vehicles (HOV) Lanes Based on an Analysis of Crash Data from Dallas, Texas* (College Station, Texas: September 2003).

Transportation staff can summon emergency, police, and tow truck crews to resolve problems and direct traffic. Thus, in the event of an incident on the HOT lanes, the lanes can be closed and, because there are no permanent barriers between the HOT lanes and the adjacent unpriced lanes, traffic can be diverted to the adjacent unpriced lanes. In the event of an accident in the unpriced lanes, the lanes can be closed and traffic diverted to the HOT lanes and tolls temporarily lifted.

Since the HOT lanes on I-95 opened for traffic in December 2008, preliminary safety data found that the number of reported incidents involving accidents, debris, and stalled vehicles in the northbound express lanes increased from 132 in fiscal year 2009 to 209 in fiscal year 2010.[34] Florida Department of Transportation officials have suggested, however, that the actual number of incidents may not have increased but that incidents are now tracked more accurately. In addition, according to FHWA officials in Florida, the number and severity of crashes declined after the I-95 HOT lanes became operational. In their view, the HOT lanes decreased congestion, and as a result, fewer rear-end crashes occurred. Additionally, FHWA officials stated that they have not seen evidence of more sideswiping since the traffic lanes were narrowed to form the HOT lanes. The UPA and CRD National Evaluation will assess the safety impacts of pricing, including the number of accidents and their severity and any change in the perception of safety by travelers and emergency personnel since pricing began.

Concluding Observations

Although traffic congestion has declined recently in many metropolitan areas, future demand for travel during peak times is expected to increase as the population grows and the economy recovers. Fiscal and environmental concerns prevent building new capacity in many metropolitan areas. Transportation decision makers have a variety of traffic demand management tools, including road or congestion pricing, to more efficiently operate and manage their infrastructure. Pricing has the potential to reduce congestion by influencing drivers to carpool, use transit, or drive at off-peak travel times. Congestion pricing has, where evaluated, helped reduce congestion. However, it is difficult to draw overall conclusions about

[34]As multiple years of safety data are needed to make conclusions, the current level of data is inconclusive. The UPA and CRD National Evaluation Framework will measure safety implications of pricing projects. As I-95 is a UPA site, data is being collected to evaluate safety changes due to the project.

the effectiveness of pricing because only half the sponsors with projects now open to traffic have evaluated their projects. Other results, where available, are mixed, as project sponsors have used different measures to assess performance and little has been done to compare performance across projects. Where congestion pricing projects have also added lanes, the results of pricing have not been distinguished from the results of adding capacity. Finally, congestion pricing's impact on traveler behavior and equity has yet to be fully explored.

Congestion pricing in the United States is in its relative infancy. With about 400 miles of priced lanes in operation, which includes 150 miles of the New Jersey Turnpike, pricing has not been implemented beyond a limited number of locations. However, its popularity is growing. New projects under construction and in planning will not only increase the number of roadway miles that use congestion pricing, they will also change the character of pricing in the United States, as some will be operated privately and some will add congestion-priced tolls to previously nontolled roadways. The changing character of congestion pricing and the new challenges it brings make improving the understanding of congestion pricing even more important.

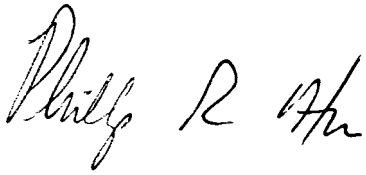
While a more complete understanding of the potential benefits and effects of congestion pricing is needed, we are not making a recommendation in this report because the evaluations conducted through the UPA and CRD programs are an important step to furthering understanding of the relevant benefits and effects of pricing. These evaluations of pricing projects address reservations we have about gaps in knowledge about such projects—for example, these evaluations will compare results across projects to assess the effectiveness of congestion reduction strategies and assess several measures of equity. In addition, monitoring and reporting on the five ELD projects could also provide better information about the performance of pricing and its effects. However, only one of the six UPA and CRD metropolitan sites has been evaluated and only for its first phase and four of the five ELD projects are under construction. As such, we cannot assess the evaluation framework or their results until projects and their evaluations are complete.

Agency Comments

DOT provided technical comments, which we incorporated as appropriate.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies of this report to congressional subcommittees with responsibilities for surface transportation issues and the Secretary of Transportation. In addition, this report will be available at no charge on GAO's website at http://www.gao.gov.

If you or your staff have any questions about this report, please contact me at (202) 512-2834 or herrp@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff that made significant contributions to this report are listed in appendix V.



Phillip R. Herr
Director, Physical Infrastructure Issues

Appendix I: Objectives, Scope, and Methodology

Our work was focused on the performance of congestion pricing projects on highways, bridges and tunnels in the United States and issues associated with developing and implementing pricing projects. We examined (1) the federal role in supporting congestion pricing, (2) results of congestion pricing projects in the United States, and (3) emerging issues in congestion pricing projects. Our scope was limited to assessing congestion pricing projects in the United States that involved passenger vehicles. We did not review other types of congestion pricing such as priced parking facilities. We collected information on pricing projects directly from the 19 project sponsors of the 41 operational or under construction congestion pricing projects and received comments and validation of data from project sponsors.

To address the federal role in supporting congestion pricing, we reviewed pertinent legislation and regulations; prior GAO reports and testimonies; and relevant documents from the U.S. Department of Transportation (DOT), state departments of transportation, and metropolitan planning organizations (MPO). This included policy documents from the Federal Highway Administration (FHWA) and various public presentations made by FHWA officials. We interviewed FHWA and Federal Transit Administration (FTA) officials, officials from state DOTs and MPOs, experts from academia and policy institutions, the Congressional Research Service (CRS), and the Congressional Budget Office (CBO). Our discussions with FHWA included DOT's programs that involve tolling—Value Pricing Pilot Program (VPPP), High Occupancy Vehicle (HOV) Facilities, Express Lanes Demonstration, Section 129 program, the Interstate System Reconstruction and Rehabilitation Toll Pilot Program, and the Interstate System Construction Toll Pilot Program. We also discussed the Urban Partnership Agreement (UPA) and Congestion Reduction Demonstration (CRD) programs—one-time initiatives that were established with 10 separate federal grant programs. We discussed the eligibility and performance monitoring requirements of the federal programs and associated projects and verified this information with DOT documents. We also collected data of VPPP and UPA and CRD program funding from DOT and corroborated the status of the project data in interviews with FHWA. We analyzed the VPPP and UPA and CRD program funding to assess how federal funds are used to support congestion pricing projects. We interviewed sponsors of pricing projects that received federal funds on how the funds were used and with what results. We reviewed relevant FHWA environmental assessment manuals and interviewed FHWA officials about the environmental review process. We also interviewed FHWA field staff and project sponsors regarding their individual project's environmental review process.

To determine the results of congestion pricing projects in the United States, we reviewed performance evaluation reports from eight project sponsors that covered 14 of the 30 operational pricing projects. The remaining project sponsors did not have current and completed evaluations because their projects had opened too recently for sponsors to have evaluated them or because projects had changed significantly in character since they were studied and thus the original evaluations are no longer relevant. In addition, one project evaluation did not use pre- and post-data to measure performance and thus the impact of pricing could not be measured. Two project sponsors (one sponsor of the SR 261, SR 241, and SR 133 in Orange County, California and one sponsor of the SR 73 in Orange County, California) did not perform evaluations of their peak-period priced highways. Two project sponsors (one for I-15 in Salt Lake City, Utah, and one for I-10 and US 290 in Houston, Texas) completed performance evaluations, however these three highways have significantly changed in character since then and thus the original evaluations are no longer relevant. For example, I-15 in Salt Lake City currently uses electronic tolling with dynamic pricing whereas when the project was evaluated a monthly decal with a static toll was used. I-10 was evaluated as one HOT lane with free access of carpools of 3 passengers but is now 2 HOT lanes with free access for carpools of 2 passengers. In addition, although US 290 was assessed in the I-10 evaluation, no pre- and post-data were used to measure the impact of pricing on performance. The project sponsor of I-25 in Denver, Colorado reported on monthly counts of traffic volumes and other measures but did not do so before and after pricing was introduced; therefore, we were unable to use the data to compare with other projects. Three project sponsors (I-680 in Alameda County, California; the San Francisco-Oakland Bay Bridge in California; and MD-200 in Montgomery County, Maryland) implemented projects recently and have not had adequate time to evaluate the projects.[1] Three other projects—I-35 W in Minneapolis, Minnesota, which has the same project sponsor as I-394; SR 520 in Seattle, Washington, which has the same project sponsor as SR 167; and I-85 in Atlanta, Georgia—became operational recently and have also not been evaluated. I-35W, SR 520, and I-85 will be assessed as part of the UPA evaluations.

[1]According to the project sponsor, preliminary analysis comparing traffic counts between July and September 2009 and July and September 2010 found reduced traffic volumes. Traffic volume decreased by 8.4 percent in July and 7.3 percent in September during the a.m. and p.m. peak periods respectively. In September, traffic volume decreased by 6 percent and 3.9 percent during the a.m. and p.m. peak periods respectively. A comprehensive evaluation study is under way.

The eight project sponsors with current and completed evaluations we reviewed were I-95 in Miami, Florida; I-15 in San Diego, California; SR 91 in Orange County, California; SR 167 in Seattle, Washington; I-394 in Minneapolis, Minnesota; the New Jersey Turnpike, New Jersey; two bridges in Lee County, Florida; and four bridges and two tunnels managed by the Port Authority of New York and New Jersey, New York. For each, we assessed the studies' methodology to determine whether or not the data reported was valid and sufficient for our analysis. However, we did not conduct a thorough assessment of the quality of the evaluations' methods as our objective was to assess the projects' performance results where available. Once we determined which data was sufficiently reliable for our uses, we summarized the results reported in each performance evaluation for each project. The eight performance evaluations assessed various performance measures such as traffic speed, travel time, throughput, and transit ridership. The performance measures we focused our analysis on were: travel time and speed, throughput, off-peak travel, transit ridership, and equity. As a basis for assessing what performance measures we should review, we used a list of performance measures, some of which are outlined in the DOT's UPA and CRD National Evaluation Framework. We chose these measurement areas because they were the most commonly reported in the evaluations and because they are the most commonly required measures for projects with federal monitoring requirements. We corroborated our choice of measures with FHWA and the Battelle Memorial Institute which is conducting the UPA evaluations using similar measures. We then compared the projects by qualitatively assessing the results for the five performance measures listed above and counting how many of the projects reported positive or negative results in each performance measurement category. We could not quantitatively compare results across projects because they did not use the same metrics and thus were assessed and reported differently according to project sponsor preference and resources. Project evaluations covered specific time periods and thus performance results are only for those time periods. Projects' performance results may have changed since evaluations were completed.

Table 3: Evaluations and Surveys Used to Analyze the Performance and Effects of Congestion Pricing Projects

Project name	Location	Evaluation
I-95	Miami, Florida	*95 Express Midyear Report: Project Status for Urban Partnership Agreement.* Florida Department of Transportation, October 30, 2009 *Miami Urban Partnership Agreement (UPA) Project: Phase 1 Transit Evaluation Report Final*. Florida Department of Transportation, January 2011 *95 Express Annual Report: Project Status for Urban Partnership Agreement (Phase 1 Complete).* Florida Department of Transportation, January 21, 2011
I-15	San Diego, California	*I-15 Congestion Pricing Project Monitoring and Evaluation Services—Task 13 Phase II Year Three Overall Report*. San Diego Association of Governments, September 24, 2001
SR 91	Orange County, California	*Evaluating the Impacts of the SR 91 Variable-Toll Express Lane Facility: Final Report*. State of California Department of Transportation, May 1998 *Continuation Study to Evaluate the Impacts of the SR 91 Value-Priced Express Lanes Final Report.* State of California Department of Transportation, December 2000
Lee County Bridges	Lee County, Florida	*Lee County Variable Pricing Project: Evaluation Report.* Lee County Variable Pricing Team, January 2001
I-394	Minneapolis, Minnesota	*I-394 MnPASS Technical Evaluation Final Report.* Minnesota Department of Transportation, November 2006 *MnPASS Evaluation Attitudinal Panel Survey Wave 3 Final Report.* Humphrey Institute of Public Affairs, University of Minnesota, August 2006
Bridges and Tunnel Crossings	New York-New Jersey	*Evaluation Study of Port Authority of New York and New Jersey Time of Day Pricing Initiative.* New Jersey State Department of Transportation, March 2005
New Jersey Turnpike	New Jersey	*Evaluation Study of New Jersey Turnpike Authority's Time of Day Pricing Initiative Final Report.* New Jersey Department of Transportation, May 31, 2005
SR 167	Seattle, Washington	*SR 167 HOT Lanes Pilot Project: Second Annual Performance Summary.* Washington State Department of Transportation, May 2008-April 2010 *SR 167 HOT Lanes Social, Economic and Environmental Justice Report.* Washington State Department of Transportation, January 2007 *SR 167 High Occupancy Toll Lanes January 2009 Focus Groups Final Report.* Washington State Department of Transportation, March 4, 2009 *SR 167 HOT Lanes Pilot Project Online User Survey.* Washington State Department of Transportation, May 2009

Source: GAO analysis of current and completed evaluations of congestion pricing projects confirmed by project sponsors.

We discussed with Battelle Memorial Institute, Texas Transportation Institute, and the Volpe National Transportation Systems Center the UPA and CRD evaluation framework including its performance measures and metrics as well as challenges of conducting an evaluation across multiple projects.

We also conducted site visits for the SR 167 and SR 520 projects in Seattle, Washington; I-95 project in Miami, Florida; and I-394 and I-35W in Minneapolis-St. Paul, Minnesota. We selected our site visits based on a judgmental sample of projects with completed evaluations; these sites included both HOT lanes and peak-period priced projects in different geographical areas of the United States. For each site visit, we met with relevant officials from state DOT, officials from the FHWA division office, project sponsors, and officials from local agencies such as the MPO and transit agencies. Discussion with project sponsors included clarifying the goal of the pricing projects and evaluations of the project performance. In addition to conducting interviews, we collected relevant documents, including environmental analyses, performance evaluations, and traveler surveys, and analyzed these documents as necessary. Where appropriate, we corroborated the interviews with documents obtained from project sponsors and FHWA.

To identify the emerging issues in congestion pricing projects, we reviewed literature on congestion pricing, equity, environmental justice, traffic diversion, safety and other topics related to the benefits, costs, and trade-offs associated with congestion pricing. We reviewed prior GAO reports and analyses and reports from the FHWA, CRS, CBO, and industry experts and organizations that have evaluated the impacts of congestion pricing projects. We discussed our review of the reports with FHWA and FTA officials, officials from state DOTs and MPOs, and transportation experts from academia and think-tanks. We identified and interviewed experts with published work on congestion pricing and its impacts. Discussions with officials and experts included the costs and benefits of congestion pricing projects, trends in pricing designs and implementation, and methods to mitigate negative impacts. We also provided a copy of the draft report to a group of experts for an independent review. We selected these experts because they have published numerous studies analyzing the benefits and challenges of congestion pricing and its effects that are prominent in the transportation literature, and come from a cross section of institutions including academia, research organizations, and the private sector. We considered and incorporated their comments into the final report as appropriate.

Group of Experts that Reviewed Draft Congestion Pricing Report

Tod Litman, Researcher, Victoria Transport Policy Institute

Lee Munnich, Professor, Senior Fellow and Director, State and Local Policy Program, Hubert H. Humphrey School of Public Affairs, University of Minnesota

Robert Poole, Jr., Director of Transportation Policy, Reason Foundation

Joseph L. Schofer, Professor, Northwestern University

Brian Taylor, Professor of Urban Planning/Director, Institute of Transportation Studies, Luskin School of Public Affairs, UCLA

David Ungemah, Senior Planning Manager, Parsons Brinckeroff

Martin Wachs, Senior Principal Researcher, RAND Corporation

We conducted this performance audit from October 2010 to January 2012 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix II: Congestion Pricing Projects Open to Traffic in the United States, 2011

Name	Location	Number of facilities or miles	Type of project	Type of pricing	Toll rates	Date pricing operational
SR 91	Orange County, California	10 miles	HOT lane	Variable pricing	$1.30-$9.75	December 1995
I-15	San Diego County, California	16- miles (4-mile extension under construction)	HOT lane	Variable pricing	$0.50-$8.00	December 1996
I-10	Houston, Texas	12 miles	HOT lane	Dynamic pricing	$0.30-$1.60	January 1998
Lee County Bridges	Lee County, Florida	2 bridges	Bridge	Peak-period pricing	$1.50-$6.00 (+ charge by axle)	August 1998
New Jersey Turnpike[a]	New Jersey	148 miles	Highway	Peak-period pricing	$0.90-$9.05	September 2000
US 290	Houston, Texas	15 miles	HOT lane	Peak-period pricing	$2.00 for HOV2 users	November 2000
Bridge and Tunnel Crossings	New York-New Jersey	4 bridges and 2 tunnels	Bridge and Tunnel	Peak-period pricing	$4.00-$8.00	March 2001
SR 73	Orange County, California	15 miles	Highway	Peak-period pricing	$3.95-$5.75	February 2002
SR 261	Orange County, California	6.6 miles	Highway	Peak-period pricing	$1.30-$2.25	February 2002
SR 241	Orange County, California	22.2 miles	Highway	Peak-period pricing	$2.10-$3.00	February 2002
SR 133	Orange County, California	4.1 miles	Highway	Peak-period pricing	$1.60-$2.25	February 2002
I-394	Minneapolis-St. Paul, Minnesota	11-miles	HOT lane	Dynamic pricing	$0.25-$8.00	May 2005
I-25	Denver, Colorado	7-miles	HOT lane	Variable pricing	$0.50-$4.00	June 2006
I-15	Salt Lake City, Utah	40 miles (11-mile extension under construction)	HOT lane	Dynamic pricing	$0.25-$1.00	September 2006
SR 167	Seattle, Washington	9 miles southbound 11 miles northbound	HOT lane	Dynamic pricing	$0.50-$9.00	May 2008
I-95	Miami-Ft. Lauderdale, Florida	7 miles (15-mile extension under construction)	HOT lane	Dynamic pricing	$0.25-$7.00	December 2008
I-35W	Minneapolis-St. Paul, Minnesota	16 miles	HOT lane	Dynamic pricing	$0.25-$8.00	September 2009
Dulles Greenway	Loudoun County, Virginia	14 miles	Highway	Peak-period pricing	$3.70-$4.50	January 2009
Pocahontas Parkway	Richmond, Virginia	8.8 miles	Highway	Peak-period pricing	$2.75-$3.00	January 2011

Name	Location	Number of facilities or miles	Type of project	Type of pricing	Toll rates	Date pricing operational
San Francisco-Oakland Bay Bridge	San Francisco Bay Area, California	8 miles	Bridge	Peak-period pricing	$2.50-$6.00	July 2010
I-680	Alameda and Santa Clara Counties	14 miles	HOT lane	Dynamic pricing	$0.30-$1.75	September 2010
I-85	Atlanta, GA	15.5 miles	HOT lane	Dynamic pricing	$1.55-$13.95	October 2011
MD-200[b]	Montgomery County, MD	7 miles (in operation, 11 are under construction)	Highway	Peak-period pricing	$0.60-$1.45	November 2011
SR 520	Seattle, Washington	Bridge	Bridge	Variable pricing	$0-$5.00	December 2011

Source: GAO analysis.

[a]The New Jersey Turnpike discontinued off-peak discounts to out-of-state vehicles as of July 2011.

[b]As of September 2011, 1 mile of MD 200 extension is under procurement.

Appendix III: DOT's Value Pricing Pilot Program Grants, Fiscal Years 1999 through 2010

Fiscal year	Funding recipients	State	Project type	Project	Status	Grant Amount
1999	Orange County	CA	Managed Facility	Implementation of peak pricing on the SJHTC / SR 73	Study Completed	$190,400
	Orange County	CA	Managed Lanes	SR 91 evaluation	Study Completed	$314,762
	Statewide	MD	Regional	Feasibility of value pricing at 10 locations	Study completed	$687,536
	Twin Cities	MN	Regional	Regional study and outreach	Study and outreach completed	$778,800
2000	San Diego	CA	Managed Lanes	Extension of I-15 HOT lanes	Study completed	$932,000
	San Francisco	CA	Car Sharing	Implementation and evaluation of car sharing	Implementation completed	$742,000
	Santa Cruz	CA	Managed Lanes	HOT lanes on median of Route 1	Study completed	$264,000
	Lee County	FL	Managed Facility	Variable pricing of heavy vehicles	Study completed	$604,000
	Lee County	FL	Managed Facility	Priced queue jumps	Study completed	$309,280
	Miami-Dade Co.	FL	Managed Facility	Pricing options on Florida Turnpike	Study completed	$696,320
	Houston	TX	Managed Lanes	HOT lanes on three radial corridors	Implementation completed	$2,436,000
	Seattle	WA	Parking	Parking cash-out	Study completed	$419,500
2001	Orange County	CA	Managed Lanes	Variable tolls on SJHTC/ SR 73	Implementation completed	$344,800
	San Diego	CA	Managed Lanes	Extension of I-15 HOT lanes	Study completed and project implemented	$28,000
	San Francisco	CA	Car Sharing	Carsharing	Evaluation completed	$378,186
	Denver	CO	Managed Lanes	HOT lane on C-470	Study completed	$500,000
	Ft. Myers Beach	FL	Cordon Pricing	Cordon pricing	Study completed and implemented	$545,600
	Lee County	FL	Managed Facility	Variable tolls for heavy vehicles	Implementation completed	$428,000
	Atlanta	GA	Insurance	Mileage-based insurance/ FAIR lanes	Implementation completed	$1,035,465
	Statewide	MN	Variable Auto Costs	Variablization of fixed auto costs	Implementation completed	$1,050,931
	New York metro area	NJ	Managed Facility	Variable tolls on river crossings	Evaluation completed	$594,673

Fiscal year	Funding recipients	State	Project type	Project	Status	Grant Amount
	Statewide	NJ	Managed Facility	Variable tolls on N.J. Turnpike	Evaluation completed	$477,468
	Statewide	OR	Regional	Financing infrastructure with value pricing	Study completed	$320,000
	Philadelphia	PA	Managed Facility	Variable tolls on PA Turnpike	Study completed	$776,000
	Seattle	WA	Parking	Parking cash-out and pricing	Implementation completed	$499,280
	Seattle	WA	Cash-out of Cars	Cash-out of cars	Implementation completed	$98,832
2002	Alameda County	CA	Dynamic Ridesharing	Highway pricing with dynamic ridesharing	Study and implementation completed	$595,250
	Denver	CO	Managed Lanes	HOT lane on I-25	Implementation completed	$1,721,526
	Broward County	FL	Managed Lanes	Variable tolls with open road tolling	Study completed	$320,000
	Ft. Myers Beach	FL	Cordon Pricing	Cordon pricing	Study completed	$500,000
	Statewide	FL	Regional	Sharing of technology on pricing	Study completed	$210,000
	Statewide	MN	Regional	Project development outreach	Study completed	$950,000
	Raleigh/Piedmont	NC	Managed Lanes	HOT lanes on I-40	Study completed	$402,400
	Portland	OR	Managed Lanes	HOT lanes on Hwy. 217	Study	$400,000
	Statewide	OR	Regional	Financing infrastructure with value pricing	Study/Implemented	$900,000
	Philadelphia	PA	Managed Facility	Variable tolls on PA Turnpike	Implementation	$800,000
	Dallas-Ft. Worth	TX	Managed Lanes	HOT lanes on I-30 /region-wide study	Study	$152,000
	Seattle	WA	GPS-Based Pricing	GPS-based pricing	Implementation	$1,880,000
2003	Denver	CO	Managed Lanes	HOT lane on I-25	Implementation	$1,078,474
	Lee County	FL	Managed Facility	Priced queue jumps	Design	$1,069,120
	Miami-Dade Co.	FL	Managed Lanes	HOT lanes on I-95	Study	$508,000
	Chicago	IL	Managed Facility	Variable tolls on Northwest Tollway	Study	$360,000
	New York metro area	NJ	Regional	Express bus/HOT lane study	Study	$670,033

Fiscal year	Funding recipients	State	Project type	Project	Status	Grant Amount
	Statewide	OH	Regional	Truck toll pricing study	Study	$200,000
	San Antonio	TX	Managed Lanes	I-35 HOT lane study	Study	$160,000
	Northern Virginia	VA	Regional	HOT lanes regionwide	Study	$500,741
2004	Alameda Co	CA	Managed Lanes	I-680 SMART Carpool Lanes	Study completed and project implemented	$714,000
	San Diego	CA	Managed Lanes	Violation Enforcement on I-15 HOT Lanes	Study ongoing and technology not introduced	$699,772
	Miami	FL	Managed Lanes	I-95 Managed Lanes Research and Educational Outreach	Study completed and early phase of 95 Express 1st phase completed	$208,000
	Orlando	FL	Managed Lanes	Express Lanes on I-4	Study cancelled	$400,000
	Atlanta	GA	Regional	Pricing Atlanta's Interstate System	Study completed and early phase of Atlanta CRD project though not implemented yet	$1,180,863
	Atlanta	GA	Managed Lanes	Value Pricing on the I-75 HOV/BRT Project	Study completed and pursuing implementation	$400,000
	Minneapolis	MN	Managed Lanes	I-394 Pricing-Planning, Outreach and Education	Study completed and project implemented	$925,000
	New York	NY	Managed Lanes	Express Bus/HOT Lane in Lincoln Tunnel	Study completed and considering implementation	$416,000
	Statewide	OR	Mileage-Based Fee	Mileage-based Road User Fee	Feasibility study completed	$943,949
	Dallas-Ft. Worth	TX	Managed Facility	I-30 Managed Facility Operational Plan	Study completed executed ELDP toll agreement thus pursuing	$472, 416
	Houston	TX	Managed Lanes	Houston HOT Network	Study completed and seeking toll authority thus pursuing	$460,000
	Seattle	WA	Managed Lanes	SR 167 HOT Lanes	Study completed and project implemented	$1,180,000
2005	Alameda Co	CA	Managed Lanes	I-680 SMART Carpool Lane in Alameda County	Study completed and project implemented	$950,000
	San Francisco	CA	Cordon Pricing	Area Road Charging and Parking Pricing	Study completed but not pursuing implementation	$1,040,000
	San Diego	CA	Managed Lanes	Violation Enforcement System on I-15 HOT Lanes	Study completed and project implemented	$568,678

Fiscal year	Funding recipients	State	Project type	Project	Status	Grant Amount
	Atlanta	GA	Managed Facility	I -75 South Feasibility of HOT/Truck-Only Toll (TOT) Implementation	Feasibility study completed but not pursuing implementation	$242,388
	Washington	DC	Managed Lanes	Regional Network of Value Priced Lanes	Feasibility study; elements being pursued for implementation	$240,000
	Seattle	WA	Managed Lanes	State Route 167 HOT Lane Pilot	Study completed and project implemented	$880,000
	Orange	CA	Managed Lanes	Implementation of Dynamic Pricing on SR 91	Study withdrawn	$588,000
	Savannah	GA	Managed Facility	Northwest Truck Tollway	Study completed but not pursuing implementation	$472,000
	Austin	TX	Managed Lanes	Loop 1 HOT Lane	Study completed and pursuing	$172,000
	Austin	TX	Managed Lanes	Deliberative Polling-Loop I Corridor	Study completed	$160,000
	San Antonio	TX	Managed Lanes	IH-10 Value Priced Express Lanes	Study completed but not pursuing implementation	$129,600
	Waco	TX	Managed Lanes	I-35 Value Priced Express Lanes	Study complete executed ELDP toll agreement and pursuing	$440,000
	Lee County	FL	Managed Facility	Expansion of Value Pricing to the Sanibel Bridge and Causeway	Study cancelled	$200,000
	Atlanta	GA	Managed Lanes	GA-400 Variable Pricing Institutional Study	Study completed and project implemented	$444,000
	Austin	TX	Managed Lanes	Truck Traffic Diversion Using Variable Tolls	Study withdrawn	$148,000
	Seattle	WA	GPS-Based Fee	Global Positioning System (GPS) Based Pricing Pilot Program	Feasibility study completed	$600,000
2006	NE Illinois	IL	Managed Facilities	Comprehensive Pricing in NE Illinois	Study completed and considering pricing in 2 corridors	$750,000
	Santa Clara County	CA	Managed Lanes	Investigation of Pricing Strategies	Study completed pursuing VPPP toll agreement	$760,000
	San Diego	CA	Parking	Priced Smart Parking Field Test	Study completed	$640,000

Fiscal year	Funding recipients	State	Project type	Project	Status	Grant Amount
	San Francisco	CA	Car Share	City Car Share Pricing Innovations	Study completed	$436,000
	Riverside County	CA	Managed Lanes	Analysis of Environmental Effects of Pier Pass	Study completed	$118,311
	Tampa	FL	Car Share	Dynamically-Priced Carsharing	Study completed	$331,289
2007	Port Authority of New York and New Jersey	NJ	Managed Facilities	Upgrade of Electronic Toll Collection Technology	Study withdrawn	$988,000
	Puget Sound/Seattle Area	WA	Managed Lanes and Facilities	Puget Sound Tolling Strategies	Study completed but not pursuing implementation	$935,000
	Twin Cities	MN	Managed Lanes	FAST Miles	Study completed and project implemented	$60,000
	Twin Cities	MN	Parking	Parking Pricing Demonstration	Study completed	$580,000
	Twin Cities	MN	Mileage-Based Fee	Mileage-Based User Fee Regional Outreach	Study completed	$230,000
	Puget Sound/Seattle Area	WA	Insurance	Pilot Implementation of PAYD Insurance with King County, Washington and Unigard Insurance Group	Study completed	$1,900,000
2007-2008[a]	San Francisco Bay Area	CA	Parking	SFPark Urban Partnership	Feasibility study completed	$10,000,000
	Minnesota Department of Transportation	MN	UPA	MN Innovative Choices for Congestion Relief UPA	Study completed and project implemented	$5,000,000
	Washington State Department of Transportation /King county/Puget Sound	WA	UPA	Seattle/Lake Washington Corridor Tolling and Transit UPA	Study completed and project will be implemented in April 2011	$10,000,000
2009	Caltrans/Valley Transportation Authority	CA	Managed Lanes	Implement Roadway Pricing on SR 237 Express Connectors	Pursuing toll authority to implement	$3,200,000
	Twin Cities Area	MN	Managed Facilities	Feasibility Study on Pricing Innovative Lane Additions on Trunk Highway 77	Study withdrawn	$540,000
	Twin Cities Area	MN	Managed Lanes	Pre-Implementation Study of Priced Managed Lane on I-94	Study just started	$400,000
	Greater Buffalo Niagra Regional Authority	NY	GPS-Based Fee	Pre-implementation of Study of GPS-Based Truck Pricing System	Study completed	$717,000

Fiscal year	Funding recipients	State	Project type	Project	Status	Grant Amount
	Puget Sound/Seattle Area	WA	Managed Lanes	Express Lanes System Concept Study	Study underway	$1,280,000
2009-2010	Caltrans / Santa Clara County	CA	Parking	Strategies to Manage Traffic and Parking	Feasibility study underway	$2,358,000
	Caltrans / City of Berkeley	CA	Parking	Strategies to Manage On-Street Parking and Reduce Congestion From Circling Vehicles.	Feasibility study underway	$1,800,000
	Caltrans / Santa Barbara County	CA	Carpool	Testing of carpooling system that uses participation incentives	Feasibility study underway	$158,400
	Florida Department of Transportation	FL	Managed Lanes	Initiative for a Regional Priced Managed Lane Network that Can Serve as a Model for Other Regions	Feasibility study underway	$900,000
	Tampa-Hillsboro Expressway Authority	FL	Managed Lanes	Advancement of First Regional Network of Bus Toll Lanes in the Tampa Area	Feasibility study underway	$800,000
	North Carolina Department of Transportation and Charlotte Metropolitan Planning Organization	NC	Managed Lanes	Advancement of First Regional Network of Priced Lanes in the Charlotte Area	Feasibility study underway	$400,000
	Minnesota Department of Transportation	MN	Parking	Expansion of Project to Test Incentive Alternatives to Monthly Parking Passes and Discourage Daily Driving	Feasibility study underway	$24,800
	Texas Department of Transportation	TX	Insurance	Usage-Based Insurance Pricing and Additional Incentives for Efficient Travel Choices	Feasibility study underway	$1,948,000
	Virginia Department of Transportation and Washington Council Of Governments	VA	Managed Lanes	Advancement of Regional Pricing in DC Including Pricing Existing Facilities	Feasibility study underway	$320,000
	Washington State Department of Transportation and King County	WA	Parking	Implementation of Incentives as Alternatives to Parking	Feasibility study underway	$1,024,000
Total awarded for Fiscal years 1999-2010						**$92,702,843**

Fiscal year	Funding recipients	State	Project type	Project	Status	Grant Amount
2010-2011	California Department of Transportation	CA	Managed Lanes	Evaluate the application of cordon/area pricing within major activity centers in the downtown Los Angeles core and build out a network of HOT lanes	Approved for Funding	$3,200,000
	Connecticut Department of Transportation	CT	Managed Lanes	Study the application of pricing on the I-84 Viaduct, Hartford, CT including assessing the impacts of environmental justice issues that resulted from the original construction of the viaduct	Approved for Funding	$644,000
	Connecticut Department of Transportation	CT	Managed Facility	Study the application of full facility pricing to the I-95 Corridor from New York to New Haven, CT and identify how toll revenues would be applied to provide strong support for transit	Approved for Funding	$1,120,000
	Florida Turnpike Enterprise	FL	Managed Facility	Evaluate a two-tiered pricing on an existing toll facility and develop performance measures to track the changes in congestion, air quality, safety, livability and other factors that would result.	Approved for Funding	$600,000
	Illinois State Highway Tollway Authority	IL	Managed Facility	Study will look at the application of pricing on an existing toll road and will evaluate steps to mitigate equity concerns for potential low income users. The project will also evaluate how transit could be integrated and financed through priced managed lanes	Approved for Funding	$528,840

Fiscal year	Funding recipients	State	Project type	Project	Status	Grant Amount
	Dallas Area Rapid Transit	TX	Managed Lanes	Study will look at a transit credit program designed to provide occasional free use of the HOT lane for regular transit users when they need to drive, and a parking pricing program at a park and ride lot with free parking and shuttle services added from a more distant lot.	Approved for Funding	$160,000
	Texas Department of Transportation and North Central Texan Council of Governments	TX	Managed Lanes	Influencing Travel Behavior and Considering Environmental Justice. Would examine important environmental justice issues related to pricing I-30, through the use of innovative Intelligent Transportation Systems (ITS) technology. The project is important because it will provide more data on environmental justice and pricing, given that there is little experience with strategies designed to address environmental justice issues related to the introduction of pricing. This project was selected because it met the statutory eligibility criteria and was highly qualified for the above stated reasons. Therefore, this project meets the evaluation criteria for innovation, equity, and congestion reduction.	Approved for Funding	$588,301

Fiscal year	Funding recipients	State	Project type	Project	Status	Grant Amount
	Texas Department of Transportation and Central Texas Regional Mobility Authority	TX	Managed Facility	183A Turnpike Pilot Downstream Impacts. Pilot implements a peak period toll in conjunction with dynamic ridesharing on an existing congested toll road. Would explore applying dynamic ridesharing as an equity mitigation strategy. An actual field trial is included as part of project. The road opens in 2012. The local agencies are contributing their own funds to support the project. Therefore, this project meets the evaluation criteria for innovation, livability, sustainability, equity, congestion reduction, safety and state of good repair.	Approved for Funding	$1,220,424
Total approved for funding for Fiscal year 2010-2011						**$8,061,565**
Total awarded and approved for Fiscal years 1999-2011						**$10,764,408**

Source: U.S. Department of Transportation.

[a]Fiscal year 2008-2009 grants were part of the one-time Urban Partnership Agreement initiative.

Appendix IV: Performance and Monitoring Requirements for Federal Programs for Congestion Pricing Projects

Federal program	Performance measure	Performance metric	Performance and monitoring requirement
Express Lanes Demonstration	Travel-time reliability in priced lanes	• Report percentage of time facility is operating at a minimum average speed of 50 mph broken down by daily averages a.m. peak, off-peak, and p.m. peak hours. • Report 95th percent travel times for the managed lanes broken down by daily averages during a.m. peak, off-peak, and p.m. peak hours. The 95th percentile represents the slowest traffic day in each month and is reported in minutes. For the I-30 and I-35E projects in Texas, projects must also report the 80th percentile. • Report "Buffer Index" calculated to demonstrate performance in the managed lanes broken down by daily averages during a.m. peak, off-peak, and p.m. peak hours. The Buffer Index is the extra time that travelers must add to their average travel time when planning trips to ensure on-time arrival. • Report travel volumes and traffic volume changes on a total and percentage-change basis annually broken into daily averages for daily total by a.m. peak, off-peak, and p.m. peak hours for the managed lanes by direction • Traffic speeds and traffic speed differences from the previous year on a total and percentage-change basis annually broken into daily averages for daily total by a.m. peak, off-peak, and p.m. peak hours for the managed lanes by direction. • Report actual number of incidents and identify the effect on lane availability for the managed lanes during this time, including the length of time each such lane was unavailable.	Annual reporting to U.S. DOT required.
	Changes in mode split/ridership/vehicle occupancies of priced versus general purpose (or adjacent free) lanes	• Report number of declared High Occupancy Vehicles (HOV) for the year and differences from the previous year (on a total and percentage-change basis) broken into daily averages by a.m. peak and p.m. peak for the managed lanes. • Report number of buses (i.e., registered non-revenue accounts) for the year and differences from the previous year on a total and percentage-change basis) broken into daily averages by a.m. peak, off-peak, and p.m. peak for the managed lanes. • Report average toll charged for the year and differences from the previous year (on a total and percentage-change basis), broken into daily averages, by a.m. peak, off-peak, and p.m. peak for managed lanes.	

Federal program	Performance measure	Performance metric	Performance and monitoring requirement
		• Report average toll charged for the year and differences from the previous year (on a total and percentage-change basis), broken into daily averages, by a.m. peak, off-peak, and p.m. peak for managed lanes. • If reasonably available, report ridership volumes for the year and differences from the previous year (on a total and percentage-change basis), by vehicle type: single occupancy vehicle, HOV2+, HOV3+, bus, vanpool and other, broken into daily averages by a.m. peak, off-peak, and p.m. peak for the general purpose lanes, managed lanes, and parallel access roads as applicable. • Report on the amount of vehicle miles traveled for the year and differences from the previous year (on a total and percentage-change basis) by vehicle type: single occupancy vehicle, HOV2+, HOV3+, bus, vanpool and other, broken into daily averages by a.m. peak, off-peak, and p.m. peak on the managed lanes. • Report Metropolitan Planning Organization rideshare payments, HOV subsidy and other disbursements.	
	Transit schedule adherence	• To the extent the information is reasonably available, report on transit service reliability—percentage of on-time performance of transit service. • To the extent the information is reasonably available, report on any existing bus transit routes or sanctioned vanpool accounts utilizing the corridor in advance of opening the project for tolling. This is to be used as a benchmark for added bus transit routes or sanctioned vanpool accounts utilizing the corridor after tolling begins.	
	Application of revenue reinvestment	• Report breakdown of the use of revenue. • Report percentage of revenue used to mitigate impacts.	
	Change in criteria pollutant emissions at the regional level	• Report on the concentrations of six criteria pollutants (particle pollution, ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides and lead) during the current year and differences from the previous year (on a total and percentage-change basis) utilizing reasonably available and reliable air quality reporting tolls and mechanisms.	
HOV Facilities (HOT Lanes)	Traffic speed on priced lane to maintain express bus service	• Report a minimum average operating speed of 45 mph on the HOV lanes with a speed limit of over 50 mph or not more than 10 mph below the speed limit for HOV lanes with a speed limit less than 50 mph. This speed must be maintained for 90 percent of the time over 180 days during morning or evening weekday peak.	Annual certification required by U.S. DOT. If performance standards not met, actions must be taken to comply.

Federal program	Performance measure	Performance metric	Performance and monitoring requirement
Value Pricing Pilot	Driver behavior, traffic volumes, and travel speeds	• No specific metric required	No certification required by U.S. DOT as no specific performance standards must be met. However, participants are required to report on "value pricing" elements up to 10 years.
	Transit ridership	• No specific metric required	
	Air quality	• No specific metric required	
	Equity for low-income people	• No specific metric required	
	Transportation revenues	• No specific metric required	
Urban Partnership Agreement and Congestion Reduction Demonstration[a]	Congestion Analysis	• Percent change in route/corridor travel time by time of day • Percent change in the travel time index for comparisons across sites (having corridors of differing lengths) • Percent change in number of hours of the day with congested conditions and the number of congested travel links per day • Percent change in average travel speeds by hour of the day • Percent change in travel time reliability and planning time index • Percent change in vehicle and person trips by time of day and person and vehicle throughput • Change in traveler perceptions about congestion after deployment of strategies	Multi-year project-specific and national evaluations which U.S. DOT is overseeing.
	Tolling Analysis	• Level of service in tolled lanes • Travel-time reliability in tolled lanes • Average occupants per vehicle of tolled lanes versus general purpose lanes • Use of tolling options • Traffic density in tolled lanes • Travel-time reliability (seasonally controlled) • Days exceeding reliability and performance thresholds	
	Transit Analysis	• End-to-end travel time • Service reliability • Maximum/unconstrained travel-time ratio • Schedule adherence • User ratings of service performance • Corridor ridership • Boardings/deboardings • Service load factors • Corridor mode split (%) • Park-and-ride utilization factors	

Federal program	Performance measure	Performance metric	Performance and monitoring requirement
	Equity Analysis	• Socio-economic and geographic distribution of benefits including: tolls paid and adaptation costs; change in travel time and distance by group; total transportation cost; environmental impacts • Public perception of the individualized equity impacts of pricing • Spatial distribution of revenue reinvestment	
	Environmental Analysis	• Reduction in criteria pollutants • Reduction in noise • Reduction in vehicle miles traveled • Qualitative assessment of perceived benefits of the environment • Reductions in estimated fuel use • Use and impact of alternative fuel vehicles for transit improvements	
	Safety Analysis	• Percentage change in crash rate by type and severity • Percentage change in time to clear accidents • Change in the perception of safety by service patrol operators, state patrol officers, medical first responders, and bus operators • Change in the perception of safety by travelers	

Source: GAO analysis.

[a]This is a sample of UPA and CRD performance analyses that include measures and metrics related to the effects of congestion pricing. Other UPA and CRD analyses will look at telecommuting/travel demand management and technology as well as impacts on businesses, goods movement, and nontechnical success factors.

Appendix V: GAO Contact and Staff Acknowledgments

GAO Contact

Phil Herr, (202) 512-2834 or herrp@gao.gov

Staff Acknowledgments

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