Reason Foundation
Policy Brief No. 146
September 2017

Express Transit Lanes for Toll Roads

by Robert W. Poole, Jr.

Reason Foundation

Reason Foundation's mission is to advance a free society by developing, applying and promoting libertarian principles, including individual liberty, free markets and the rule of law. We use journalism and public policy research to influence the frameworks and actions of policymakers, journalists and opinion leaders.

Reason Foundation's nonpartisan public policy research promotes choice, competition and a dynamic market economy as the foundation for human dignity and progress. Reason produces rigorous, peer-reviewed research and directly engages the policy process, seeking strategies that emphasize cooperation, flexibility, local knowledge and results. Through practical and innovative approaches to complex problems, Reason seeks to change the way people think about issues, and promote policies that allow and encourage individuals and voluntary institutions to flourish.

Reason Foundation is a tax-exempt research and education organization as defined under IRS code 501(c)(3). Reason Foundation is supported by voluntary contributions from individuals, foundations and corporations. The views are those of the author, not necessarily those of Reason Foundation or its trustees.

Table of Contents

Assessing the Problem

Urban toll roads have played an important role in meeting mobility needs in America. These routes usually give drivers an option of a higher level of service in exchange for tolls charged to cover project capital and operating costs. As traffic demand increases and congestion grows, the toll road provider uses the increasing revenue to add lanes, thereby reducing the congestion. But in some cases, constraints on further expansion may exist: physical, economic, or political. How should a successful urban toll road cope when it confronts that problem?

If there is no realistic way to widen the congested toll road, one potential solution is to add elevated lanes. Tampa's Selmon Expressway did that in 2006, adding three reversible express lanes aimed at longer-distance commuters. That added enough additional peak-period capacity to this toll road, which brings suburban commuters to and from downtown, that the previous congestion problem was solved. In some cases, adding elevated lanes may be legally impossible (e.g., due to height restrictions adjacent to an airport) or politically very difficult. In those cases, the only feasible alternatives for significant congestion reduction are:

1) Implementing variable pricing (much higher toll rates) during peak periods on all lanes;
2) Converting one existing traffic lane each way to variable pricing; or,
3) Converting the inside shoulder each way to a new, variably priced lane.

The first is often not attractive because significantly higher prices would be unaffordable to many current customers, who would shift their travel onto already-congested parallel surface streets. The other two are sometimes considered problematic because they could be criticized as creating a Lexus Lane or a "toll within a toll."

A fourth alternative has been proposed in some cases: converting a shoulder lane to bus-only use and encouraging greater use of buses in that uncongested corridor. This approach rests on the hope that a large enough fraction of toll road users would switch to commuting by bus to lead to a significant reduction in congestion. There is little empirical evidence that this would happen, since metro areas with bus-only lanes have not seen significant increases in bus ridership. The amount of increased bus use might offset the *growth* in auto traffic, but that outcome would leave congestion in the general toll lanes at least as bad as it is today.

The amount of increased bus use in a dedicated bus lane might offset the *growth* in auto traffic, but that outcome would leave congestion in the general toll lanes at least as bad as it is today.

A good example of the above situation is the east-west Dolphin Expressway (SR 836) in Miami, Florida. This is one of five major tolled expressways operated by the Miami Dade Expressway Authority (MDX). SR 836 is undergoing the last of several capacity expansion programs at this time. When completed in 2018, SR 836 will have at least four travel lanes each way between the north-south Palmetto Expressway on the west and north-south I-95 on the east. This is considered by MDX to be as much as SR 836 can be expanded due to right-of-way constraints. It is bounded on the south by a major lake and on the north by Miami International Airport. As such, it is a good example of the problem being addressed in this paper.

It is also a good example because, as part of the final widening program, MDX will provide an improved "hard inside shoulder" through the most congested portions of SR 836 and plans to make that shoulder available for use by Express Buses in the future.

This paper offers a somewhat different approach, one that combines express bus service and variable pricing in a new policy framework, aimed at achieving significant, sustainable reductions in congestion in both the general lanes and the inside-shoulder lane.

Why Congestion Reduction Should Be the Primary Goal

Toll roads exist to offer willing customers better mobility than they can obtain on non-toll roads. But a toll road that is seriously congested during peak periods is failing to provide its customers with better mobility—thereby failing in its reason for being.

[A] toll road that is seriously congested during peak periods is failing to provide its customers with better mobility—thereby failing in its reason for being.

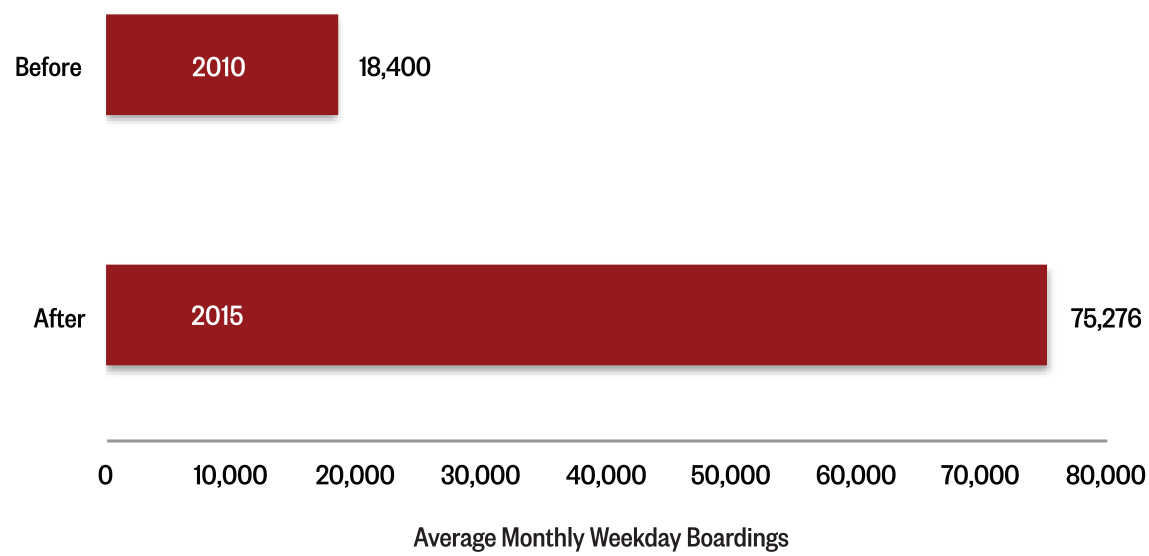
In addition, in those metro areas like Miami, Orlando, and many others that are implementing a network of uncongested express toll lanes, omitting such lanes on a congested urban toll road leaves congested gaps in what is supposed to be a free-flowing network. In the case of Miami, with the implementation of express toll lanes on I-95, SR 826 (Palmetto), and the Turnpike's Homestead Extension (HEFT), a set of north-south uncongested express toll lanes will soon exist. Yet the originally planned east-west component of that network—SR 836—will be a conspicuous missing link if the shoulder lane is used solely as a bus-only lane.

Express toll lanes enable uncongested traffic flow during nearly all peak-period conditions. The key to achieving this result is variable pricing, as seen every day on Miami-Dade's successful I-95 Express Lanes and on several dozen similar projects in Atlanta, Austin, Dallas, Denver, Houston, Los Angeles, Minneapolis/St. Paul, San Diego, the San Francisco Bay Area, Seattle, and the suburbs of Washington, D.C.

Express toll lanes have the additional benefit of providing an uncongested guideway for express bus service—at no capital cost to the transit agency or agencies that make use of them. This means an express toll lane can actually be considered an express/transit lane—an inherently multi-modal facility that is paid for entirely by those who choose to pay tolls to use it. Express bus services operate on most of the express toll lane facilities around the country. One of the largest success stories is the 95 Express bus service using the I-95 Express Lanes in Miami-Dade County. With just the initial Phase 1 lanes in operation (less than eight miles), weekday boardings per month on these bus routes increased from an average of 18,400 in February 2010 to 75,276 by December 2015, a more than four-fold increase.

Express toll lanes have the additional benefit of providing an uncongested guideway for express bus service—at no capital cost to the transit agency or agencies that make use of them.

Figure 1: I-95 Average Monthly Bus Boardings, Before And After Express Transit Lane



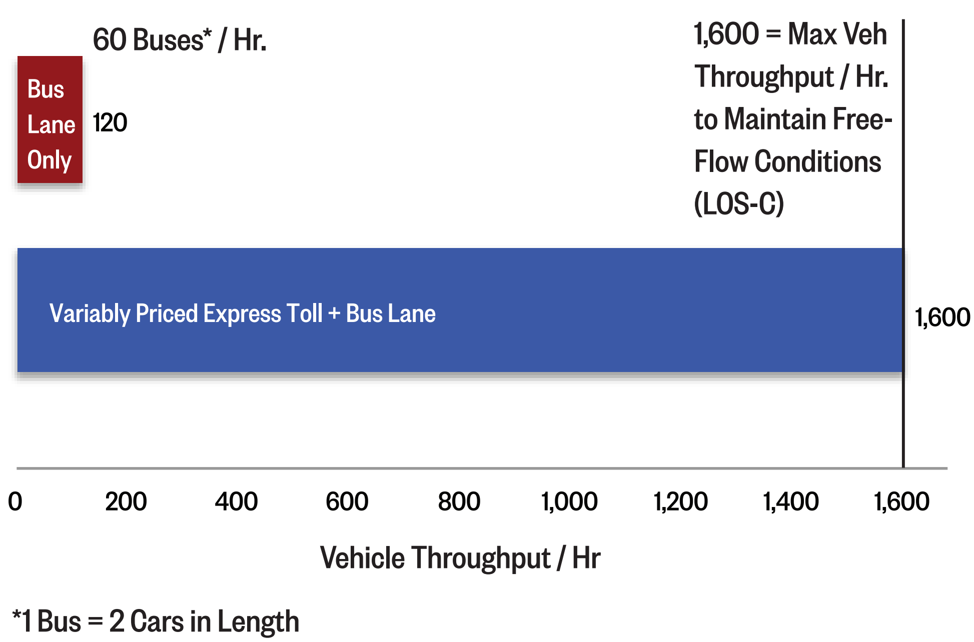
Source: "95 Express Bus Ridership," Florida DOT District 4, April 11, 2016 and "Ridership Technical Report," Miami-Dade Transit, December 2015.

Transportation planners seek to increase transit's share of commuter trips as one way of reducing peak-period congestion. For toll roads where further widening is considered infeasible, such as SR 836, one possible way to add transit service is to provide a bus-only lane on the toll road. Converting an *existing* traffic lane to bus-only would lead to massive increases in congestion that is already extreme. So the more plausible alternatives are to convert either the inside or the outside shoulder to bus-only use. Using the outside shoulder creates conflicts with vehicles seeking to enter and exit the toll road. Hence, converting the inside shoulder is generally preferred for express bus service.

The problem with a bus-only lane on a highly congested toll road is that under any realistic scenario, that lane will be seen by toll-paying customers stuck in rush-hour congestion as being mostly empty.

The problem with a bus-only lane on a highly congested toll road is that under any realistic scenario, that lane will be seen by toll-paying customers stuck in rush-hour congestion as being mostly empty. Ten buses per hour (one every six minutes) is a conceivable number in the early years of express bus service. Over a decade or two, that volume might increase to 25, 30, or even 60 per hour (one every minute). Assuming a bus is the equivalent of two passenger cars, then 60 buses per hour would use the same amount of lane capacity as 120 cars per hour. But the throughput capacity of a single lane, operating at uncongested Level of Service C (LOS C) conditions is 1,600 vehicles per hour. Consequently, that empty pavement could accommodate nearly 1,500 personal vehicles per hour without compromising high-speed express bus service. This is what we can observe every day on the I-95 Express Lanes.

Figure 2: US-Only Lane Vs. Express Toll and Bus Lane (Bus + Cars) Throughput Comparison



A Better Integrated Mobility Solution

Thus, the logic of the situation suggests that it would be foolish to waste the unused capacity in the express bus lane, since lane capacity is the scarcest resource on a highly congested toll road with no further realistic expansion options. And as noted above, toll-paying customers stuck in rush-hour congestion are likely to complain about the unused capacity sitting right next to them.

...[I]t would be foolish to waste the unused capacity in the express bus lane, since lane capacity is the scarcest resource on a highly congested toll road with no further realistic expansion options

This suggests that a new approach to shared use would make sense. The toll agency could define the shoulder lane as an Express/Transit Lane. The basic operating principle would be to accommodate up to a target level of peak-period bus service (perhaps 60 buses per hour) while limiting the entry of toll-paying personal vehicles to a number consistent with uncongested traffic flow at LOS C in that lane. The only known way to limit personal vehicle use under real-world traffic conditions is to charge variable tolls, as proven on the growing number of express toll lane facilities around the country.

The basic operating principle would be to accommodate up to a target level of peak-period bus service (perhaps 60 buses per hour) while limiting the entry of toll-paying personal vehicles to a number consistent with uncongested traffic flow at LOS C in that lane.

Concerns over the Express/Transit lane being perceived as a Lexus Lane or a “money grab” by the toll agency have troubled many agencies considering premium express lanes within a toll facility. All toll road users are paying for a better level of service, and agencies fear motorists will believe the agency is saying only those willing to pay a higher toll will get a high level of service. Yet as this paper describes, where widening is no longer viable, this is really a policy choice about how to make the best use of the shoulder lane. That policy should be designed to improve the travel of all customers, including those who do not pay a premium toll to use the express lanes.

Another factor to consider in converting the shoulder lane to an express/transit lane is the potential uses of the additional toll revenue that would be generated. One possible use of new revenue could be to help fund express bus capital investment. Sharing revenue with (or diverting revenue to) transit is often a sensitive issue for toll road operators. Their revenue bonds are subject to legally enforceable provisions called trust indentures, by which the toll agency guarantees that revenues will be used for the capital and operating costs of the toll road—ensuring that bondholders get paid for the entire life of the bonds. That would prohibit diverting ordinary toll revenue to non-toll-road uses.

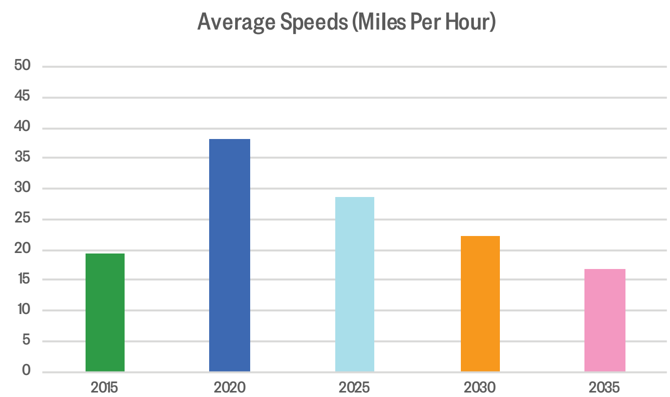
But with a new variably priced lane, the toll road operator could continue to pledge the baseline toll revenue from all toll-payers, in accordance with the trust indentures. Only the *excess* revenue from the express/transit lane (over and above revenue produced by the basic toll rate) would be set aside to pay for express bus capital costs, such as park-and-ride lots, station structures, and possibly direct-access ramps. This provision would ensure that all the basic toll revenue would still be pledged for debt service on the bonds. Only extra revenue generated by the *difference* between the variable toll rates and the general-lane toll rates would be used for the express bus capital costs. This policy would enable the toll agency to be a financial partner with transit agencies for projects such as park-and-ride facilities that would enhance the attractiveness of express bus service.

Case Study: The SR 836 Shoulder Lane Policy Alternatives

To provide an example, data on current and projected traffic on the Miami-Dade Expressway's congested SR 836 toll road were used to compare future performance under the current plan to convert the inner shoulder in each direction to a new, bus-only lane and the alternative suggested in this paper of operating the new lane as an express/transit lane. To aid in this analysis, the MDX traffic and revenue consultant provided traffic forecast information. A sketch level tool estimated travel speeds and travel times under various scenarios at several benchmark years in the future. This analysis should be confirmed through more detailed analysis, but the data shown in Figure 3 provide a realistic comparative framework for the alternative scenarios shown.

As noted above, the eastern half of SR 836 is currently being widened to four lanes in each direction. As shown in Figure 3 (left chart), when completed that will improve peak-period operating speeds on the most heavily used sections (between the Palmetto Expressway and I-95) from about 20 mph in 2015 to over 38 mph by 2020 (after widening). However, since no further widening is considered likely, as traffic grows in future years, speeds will again decline, and by 2035 may be slightly lower than before the widening project. Travel times between the Palmetto and I-95 (about eight miles) will drop from about 23 minutes to about 12 minutes after the widening, but will gradually increase again to more than 25 minutes by 2035. These speeds represent a scenario where the shoulder lane is used only by express buses, assumed at about 10 buses per hour.

Figure 3: Projected SR 836 Performance with Bus-Only Lanes (Assumes 10 Buses per Hour on Shoulder)



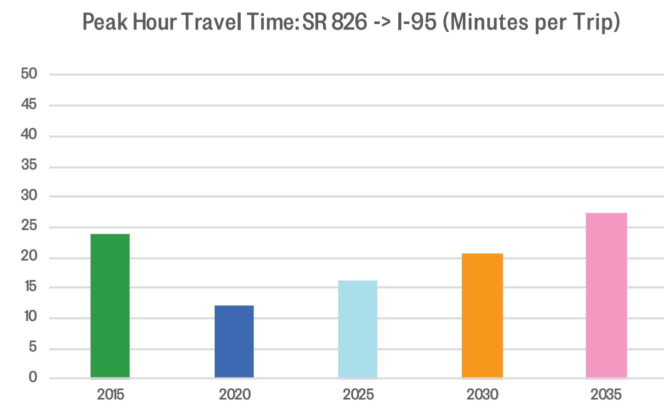


Table 1 shows average speeds during peak hours for 2020, 2025, 2030 and 2035, with possible future increases in bus service. As can be seen, because of continued growth in population and travel, with a nominal 10 buses/hour assumed to be using the shoulder lane, average peak-period speed in the general purpose lanes will decline from 38 mph in 2020 to 17 mph in 2035. Higher numbers of buses per hour—if higher demand for bus service develops as some SR 836 users switch from driving to express bus—will lead to slightly better performance by 2035 (assuming the additional buses are filled with people who formerly drove on this toll road), but even with an unlikely 60 buses/hour (one every minute during peak periods), average peak-period speed in 2035 would be only 23.5 mph, compared with the initial 2020 case of 38 mph.

Table 1: Speed Performance with Bus-Only Lane on MDX SR 836 Toll Road
Average Speed General Lanes

Buses/hour	2020	2025	2030	2035
10	**37.98 mph**	28.68 mph	22.26 mph	16.92 mph
25	40.08	30.78	24.12	18.42
40	42.84	34.38	27.36	21.12
60	46.08	37.26	30.06	**23.46 mph**

What would happen if the new inner shoulder lane was implemented as an Express/Transit Lane (ETL) instead? Under that alternative, a fraction of the personal vehicles in the general lanes would have the option of paying a higher toll to use the new lane, thereby removing themselves from the general lanes and reducing congestion in those lanes. Only a portion of

SR 836 drivers would elect to pay a premium toll to use the shoulder lane, and demand would be managed through the use of variable pricing in that lane.

Table 2 is the same as Table 1 except it assumes 10% of personal vehicles using the ETL in the 10-bus and 25-bus scenarios, and as traffic and congestion continue to increase, more people shift from driving to buses and more drivers (15%) shift to using the ETL. These values would still permit the shoulder lane to operate at generally free-flow speeds, since the majority of drivers would still be in the general purpose lanes. There are significant improvements in general-lane speeds thanks to this rearrangement of traffic on SR 836.

Table 2: Performance with Express/Transit Lane on MDX SR 836 Toll Road
Average Speed General Lanes

Buses/hour	ETL%	2020	2025	2030	2035
10	10%	42.84 mph	34.38 mph	27.36 mph	21.12 mph
25	10%	46.68	35.82	30.06	23.46
40	15%	49.02	41.52	35.82	28.68
60	15%	51.54	44.82	38.47	**32.22 mph**

How realistic are the scenarios that assume 40 or 60 buses per hour in future years? Some perspective can be gained by reviewing the performance of the 95 Express service that has been in operation on I-95 between Broward and Miami-Dade Counties since the express toll lanes opened on I-95. In February 2010 that bus service had a monthly average of weekday boardings of 18,400. By December 2015, that number had increased four-fold, to 75,276.[1] The monthly average for the end of 2015 equates to 3,585 boardings per day (assuming 21 weekdays per month), and since each round trip counts as two boardings, that means 1,792 daily bus person-trips each way. If we assume there are three peak hours in the morning, that means 1,792 passengers over three hours, which means 597 passengers per hour. At 45 passengers per bus, a bit over 13 buses per hour are needed. (This assumes, for simplicity, that transit demand, like personal vehicle demand, is highly directional in this corridor.)

1 "95 Express Bus Ridership." Florida DOT District 4. April 11, 2016; "Ridership Technical Report." Miami-Dade Transit. December 2015.

This suggests that it is probably more realistic to assume something like 10 buses/hour in the initial years, growing to a maximum of 25 buses/hour in future years, rather than the more optimistic possibilities of 40 or 60 buses/hour. Policy decisions to invest in park-and-ride stations and specially tailored express bus routes might encourage shifts to transit for the SR 836 portion of each trip. Of course, should bus demand increase to those higher levels, the variable ETL toll rates would increase, as needed, to maintain Level of Service C in the Express/Transit Lane, to ensure uncongested conditions for the buses as well as the paying customers.

In what follows, we will assume a maximum of 25 buses/hour to further explore the performance of Express/Transit Lanes. How much time would customers save under this model? And how much "excess revenue" would they generate (over and above the general-lanes toll rate) that could be dedicated to express bus infrastructure, such as park-and-ride lots, bus station facilities at those lots, and (where feasible) direct access ramps to the Express/Transit Lanes?

Table 3 estimates these numbers, based on a simple spreadsheet model. These numbers assume that ETL operations begin in 2020, initially attracting 10% of personal vehicles during peak periods, increasing to 15% in 2025 and thereafter. Express bus service begins at 10 buses/hour but increases to 25 buses/hour by 2025 and remains at that level through 2035.

...by 2025 customers on SR 836 would save 692,100 hours per year, of which 492,100 hours of savings would accrue to *drivers in the general purpose lanes who do not choose to use the express lanes.*

As can be seen in Table 3, by 2025 customers on SR 836 would save 692,100 hours per year, of which 492,100 hours of savings would accrue to *drivers in the general purpose lanes who do not choose to use the express lanes*. Excess revenue in that year would be $18.4 million. This "excess revenue" reflects the net additional revenue generated as a result of the premium variable tolls paid for express lane usage, excluding the base toll charged for using SR 836 for the trip. For example, if the express lane charge is $5.00 for a particular trip, but the base toll for that movement for using SR 836 was $1.40, the net additional revenue would come only from the $3.60 premium paid by those motorists choosing to use the express lane. By 2035 those savings would be 1.8 million hours per year and excess annual revenue would be $21.7 million.

Table 3: Express / Transit Lane Time Savings and Revenue

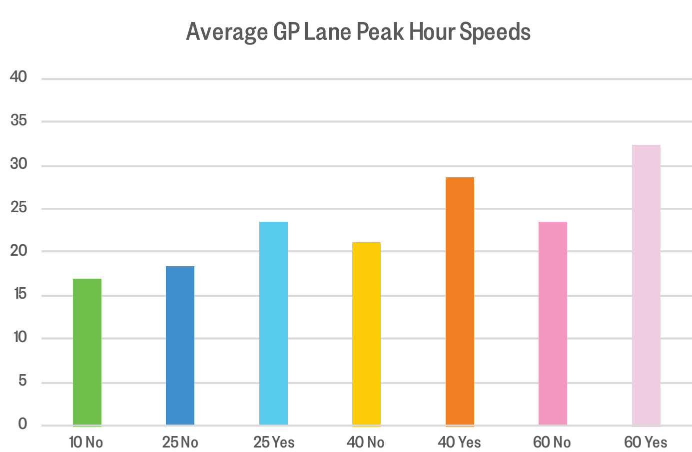
Year	Shoulder Lane Operations	Peak Hour GP Lane Demand	Average GP Lane Speed	Typical Trip Time SR826/I-95	GP Lane Time Saved Per Trip (M)	Daily Travel Hours Saved: GP Lane Users	Daily Travel Hours Saved: Total Incl. Exp. Lane	Annual Hours Saved (000): GP Lane Users	Annual Hours Saved (000) Total Incl. Exp Lane	Excess Annual Revenue (000)*
2015	None	7500	19.44	23.77						
2020	Bus+Express	7838	42.84	10.78	1.38	543	784	135.9	196.0	$10,815
2025	Bus+Express	7710	38.72	11.94	4.17	1968	2769	492.1	692.1	$18,437
2030	Bus+Express	8429	32.22	14.34	6.42	3232	4621	807.9	1155.4	$20,092
2035	Bus+Express	9118	27.36	16.89	10.42	5231	7512	1307.8	1878.0	$21,678

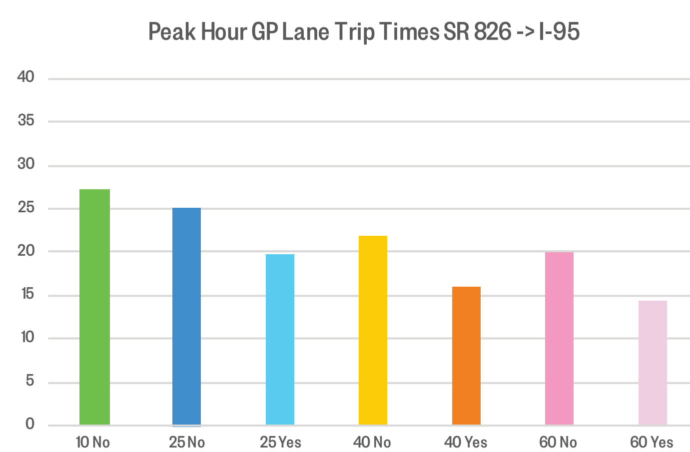
*Annual revenue from express lanes less base toll charges for using SR 836

Figure 4 below provides a comparison of several scenarios at 2035 levels on SR 836. This includes four different bus-only scenarios as well as three options that include express bus and express lane conditions. With only 10 buses per hour in 2035, average speeds would be less than 17 mph, with a trip time of 27 minutes. Increasing buses to 25 per hour slightly improves speeds to almost 19 mph, but combining 25 buses with an express lane option improves speeds to almost 25 mph in 2035. The best scenario shown assumes 60 buses per hour and 15% of individual cars choosing the express lane. Then, 2035 speeds improve to over 32 mph with trip time of less than 15 minutes. This comparison clearly shows how different policy decisions by MDX on how to use the hard left shoulder on SR 836 can significantly influence operating conditions and travel time for all users, including those remaining in the general purpose lanes.

Figure 4: 2035 Comparison of Bus-Only and ETL Scenarios (2035 Levels)

Bus Express Lanes





NOTE: “No” means a Bus-Only lane (no Express Toll Lanes) and “Yes” means a bus lane with Express Toll Lanes.

Conclusions

This paper has demonstrated the potential benefits of an integrated mobility solution and policy decisions on how to best make use of limited available capacity where future roadway widening is not viable. Urban toll roads, like our example project of SR 836 in Miami, have become increasingly congested, and the operating agency is now constructing the last viable widening project. In the short term this will improve travel speeds and overall operations, but over time conditions will again deteriorate.

Toll roads typically provide a superior level of service compared with non-tolled roads, but this can deteriorate when capacity expansion is no longer possible. Policymakers should consider integrated mobility options, such as those discussed herein, to provide the best level of service possible in the face of constraints on widening. Implementation of express bus service, possibly with a well-planned network of park-and-ride lots or garages along the project corridor, can encourage travelers to leave their cars at the entrance to the toll road, and improve operating conditions for those who choose to continue to drive.

But express bus alone may not be the best answer. A combination of expanded bus service together with peak-period express lanes operation will likely provide the best possible conditions for all drivers, including the majority of customers who will continue to use the tollway's general purpose lanes and pay traditional tolls.

About the Author

Robert W. Poole, Jr. is Director of Transportation Policy and the Searle Freedom Trust Transportation Fellow at Reason Foundation, a national public policy think tank based in Los Angeles.

His 1988 policy paper proposing supplemental privately financed toll lanes as congestion relievers directly inspired California's landmark private tollway law (AB 680), which authorized four pilot projects including the highly successful 91 Express Lanes in Orange County. About two dozen other states have enacted similar public-private partnership legislation. In 1993 Poole oversaw a study that introduced the term HOT (high-occupancy/toll) Lane, a concept which has become widely accepted since then.

Poole has advised the Federal Highway Administration, the Federal Transit Administration, the White House Office of Policy Development and National Economic Council, the Government Accountability Office (GAO), and the California, Florida, Georgia, Indiana, Texas, Utah, Virginia, and Washington State Departments of Transportation. He served 18 months on the Caltrans Privatization Advisory Steering Committee, helping oversee the implementation of AB 680. He was appointed by Gov. Pete Wilson as a member of California's Commission on Transportation Investment in 1995-96. He has also served on transportation advisory bodies to the California Air Resources Board and the Southern California Association of Governments, including SCAG's REACH task force on highway pricing measures.

Poole is a member of the board of the Public-Private Partnerships (P3) division of ARTBA and a member of the Transportation Research Board's Managed Lanes Committee. From 2003 to 2005, he was a member of the TRB's special committee on the long-term viability of the fuel tax for highway funding. In 2008 he was a member of the Study Committee on Private Participation in Toll Roads, appointed by Texas Gov. Rick Perry. In 2010 he was a member of the Washington State DOT's Expert Review Panel on the proposed Eastside Managed Lanes Corridor. Also in 2010, he served as a transportation policy advisor on the transition team of Florida Gov. Rick Scott.

Poole is the author of dozens of policy studies and journal articles on transportation issues. His book, *Rethinking America's Highways*, will be published by the University of Chicago Press in spring 2018. Poole's popular writings have appeared in national newspapers, including *The New York Times* and *The Wall Street Journal*; he has also been a guest on such programs as "Crossfire," "Good Morning America," and "The O'Reilly Factor," as well as ABC, CBS and NBC News, NPR and PBS. He writes a monthly column on transportation policy issues for *Public Works Financing*, and produces the monthly e-newsletter, *Surface Transportation Innovations*. *The New York Times* has called him "the chief theorist for private solutions to gridlock."

Poole received his B.S. and M.S. in mechanical engineering at MIT and did graduate work in operations research at NYU.

Appendix: Why the Same Toll for All Is Not the Best Policy for Congestion

The idea that a toll road might work better with two different prices has been studied by a number of transportation researchers. Stephen Shmanske, then at Cal State University, Hayward, in 1991 first suggested that different prices for different lanes would work better than the same price for all. In a 1993 paper he described modeling a two-price system for the San Francisco/Oakland Bay Bridge, finding that the gainers would outnumber the losers in switching from a uniform toll to dual tolls.[2]

The reason for this is that motorists have a vast array of values of time, which varies by time of day and by the purpose of the trip. Kenneth Small of the University of California, Irvine did detailed studies of the values of time of commuters on the SR 91 freeway in Orange County, site of the world's first express toll lanes (which opened in 1995).[3] He and his research team found that the average value of time of express toll lane users in the corridor was $25.51/hour, compared with $18.63 for commuters in the (non-tolled) general lanes. But more surprising was the *wide range* of values of time. For express lane users, this varied from a low of $11.50/hour to a high of $39.99/hour. For the general lane users, the value of time varied from a low of $7.76/hour to $29.08/hour. Moreover, the amount of toll the express lanes users were willing to pay also reflected a separate *value of reliability*—i.e. that the trip time at a given time of day would be highly predictable.

Using this information, Small and his colleagues modeled a hypothetical toll road with relatively low regular lane toll rates and higher, variable rates for express lanes. They

2 Shmanske, Stephen. "A Simulation of Price-Discriminating Tolls." *Journal of Transport Economics & Policy* 27 (3). September 1993.

3 Ng, Chen Feng and Kenneth A. Small. "Trade-Offs Among Free-Flow Speed, Capacity, Cost, and Environmental Factors in Highway Design." Aug. 29, 2008. (*www.economics.uci.edu/docs/2008-09/small-04.pdf*)

concluded that this policy produced higher overall benefits than either a flat rate toll for all lanes or non-tolled general lanes plus variably tolled express lanes.

The implications of this research strongly support two-tier pricing on congested urban toll roads. A uniform flat rate, when lane capacity is less than what customers demand, leads to peak-period congestion. Increasing that flat rate high enough to limit access enough to reduce congestion in all lanes to LOS D conditions would divert a significant fraction of existing vehicles to parallel surface streets, making those arterials more congested. And a *variable* toll rate for *all lanes* that would permit uncongested free flow conditions (LOS C) would divert much larger numbers of motorists to parallel routes.

But a two-tier approach could involve modest peak/off-peak pricing in the general lanes, which would still be affordable to most customers with moderate values of time, while shifting some peak traffic to shoulder time periods. The significantly higher variable rates in the Express/Transit Lanes would attract high-value trips, but only enough trips so as not to interfere with smooth running of the express buses.

This two-tier approach was first implemented on the PR 22 toll road in Puerto Rico in 2012. That project added two reversible Dynamic Toll Lanes to this existing toll road, open to express buses and toll-paying personal vehicles.[4] Variably priced express toll lanes are being implemented via projects under way by Florida's Turnpike on three of its existing toll roads: HEFT in Miami-Dade, Veterans' Expressway north of Tampa, and the Beachline West in Orlando. A recent paper in the Transportation Research Board's peer-reviewed journal describes these projects and the policies adopted by the Turnpike for express toll lanes on its toll roads.[5] The researchers summarize focus groups and stated preference surveys carried out in the catchment areas for these three projects, and found that "almost all the participants were receptive to the idea of express lanes" on these toll roads. They strongly preferred having a choice to use the premium lane rather than an increase in tolls on all the lanes.

4 Rios, Benjamin Colucci. "Dynamic Toll Lane: A Success Story as Part of the Public Private Partnerships in the Commonwealth of Puerto Rico." Proceedings of the 2nd International Conference on Public-Private Partnerships. Austin, TX. May 26–29, 2015.

5 Shbaklo, Saad A., Barbara Davis and Xiao Cui. "Study to Evaluate Express Toll Lanes on Florida's Turnpike." *Transportation Research Record* No. 2554. 2016.

Reason
5737 Mesmer Ave.
Los Angeles, CA 90230
310-391-2245
reason.org