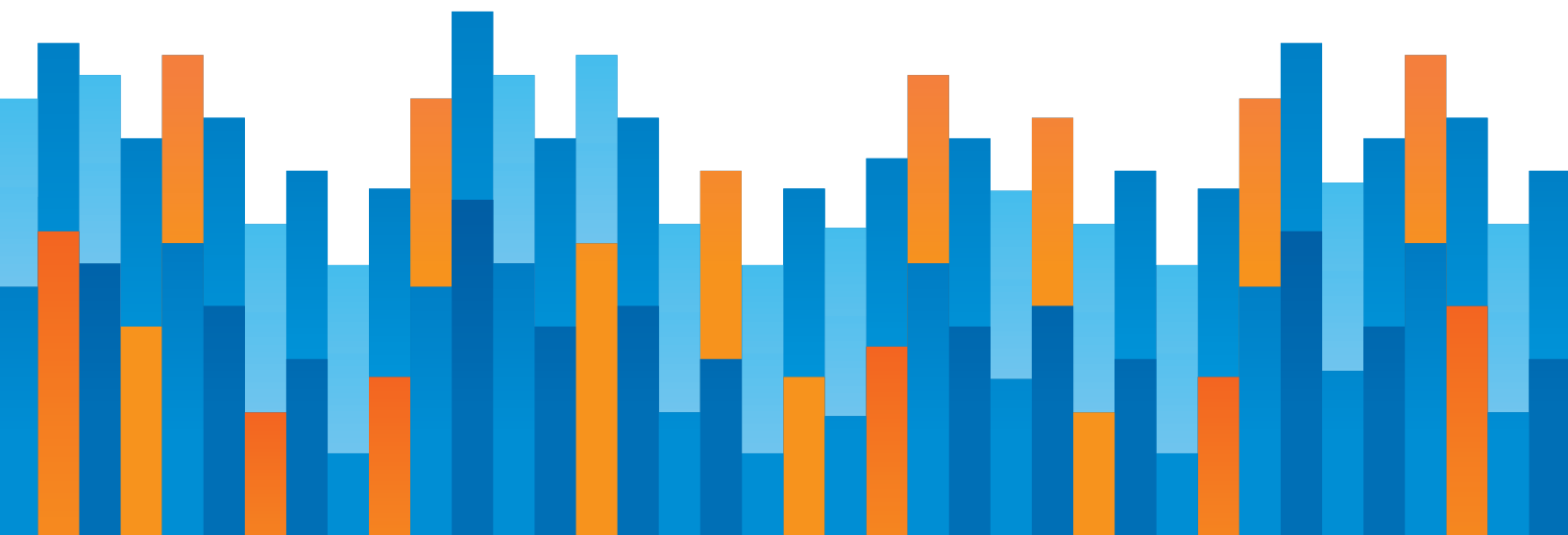




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THE CASE FOR TOLL-FINANCED INTERSTATE REPLACEMENT

by Robert W. Poole, Jr.
April 2019





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EXECUTIVE SUMMARY

In December 2018 the Transportation Research Board’s Future Interstate Study Committee released its long-awaited report, *Renewing the National Commitment to the Interstate Highway System: A Foundation for the Future*. At 649 pages, including 10 appendices, it makes a powerful, evidence-based case that the Interstates are wearing out and need what amounts to replacement. Unfortunately, the report’s main recommendation—a huge increase in federal fuel taxes to support reconstructing the system using the original 90% federal and 10% state funding program—is both highly unlikely and inadvisable.

The Committee’s *findings* are very important. First, most of the Interstate System already has, or soon will have, exceeded its original design life and will need reconstruction. A large fraction will likely require full-depth pavement replacement, from the sub-base up—and yet there are no real data available on the extent of this need, and the federal Highway Economic Requirements System includes no unit costs (per lane-mile) for this most expensive kind of reconstruction. Hence, the reconstruction cost estimates in the report may well be under-estimates.

Second, contrary to widespread assertions during the last decade that the era of traffic growth had ended, we now have renewed annual growth in vehicle-miles of travel (VMT), with truck VMT growing faster than passenger-vehicle VMT. The report uses a baseline figure of 1.5% for overall annual VMT growth, with lower and upper bounds of 0.75% and 2%. This growth supports the need for widening many corridors—and to minimize

inconvenience to highway users, if a stretch of Interstate needs widening, it's best to do this as part of the planned reconstruction process.

Dedicated truck lanes are mentioned, but assessed only on the extent to which they might reduce congestion, when their real value will be to (1) increase trucking *productivity* by allowing much greater use of longer combination vehicles (LCVs) in barrier-separated lanes, and (2) reduce environmental impact by hauling more ton-miles per gallon of fuel and facilitating fuel-saving truck platooning.

While the report's proposed \$57 billion per year for 20 years is a very large number, it would not produce as much improvement as might be imagined. Despite a \$44 billion backlog of Interstate bridge rehabilitation and replacement needs, the report would continue the current status quo approach of very gradual reduction in deficient bridges. It would accept that after 20 years of major investment, Interstate miles in "poor" condition would double, from 2% to 4%. And it would accept increases over today's massive urban Interstate traffic congestion, unless annual growth in vehicle-miles of travel were to be an unrealistically low 0.75%. At its more-realistic rates of VMT growth, congestion would be 4% worse than today (at 1.5% annual VMT growth) or 29% worse than today (at 2.0% VMT growth) after 20 years of spending \$57 billion per year.

A likely reason for the projected worsening of congestion is that the \$57 billion per year does not include two major needs the report discusses: networks of express toll lanes on urban Interstates in very large metro areas and the replacement of up to 100 obsolete bottleneck interchanges in urban areas. Those improvements are already reducing congestion in the metro areas where they have been implemented, but are not included in the report's investment proposal.

On the *recommendations* for how to pay for and accomplish Interstate modernization, the report is most disappointing. Its analysis includes discussion of many factors that could have led to a bold proposal, such as financing the needed replacement and modernization based on toll revenue. The report discusses the merits of tolling compared with the projected decline of fuel taxation as vehicle propulsion changes (such as increased use of electric vehicles) in coming decades. And it also explains the wisdom of *financing* large-scale, long-lived capital improvements to infrastructure, which enables the benefits to be received sooner. It discusses the need to shift from per-gallon taxes to per-mile charges, but never makes the obvious point that a per-mile toll *is a mileage-based user fee*—and that

converting the Interstates to per-mile tolling would transition over 25% of all U.S. VMT to per-mile charging.

To its credit, the report *does* recommend removing the 1956 federal ban on tolls on the Interstates (other than the few segments that were already in operation or under construction as toll roads in 1956). And it mentions the need, in coming decades, for electric vehicle charging stations “on” the Interstates, but never faces up to the federal ban on such commercial services being provided at Interstate rest areas. The only way out of that conundrum would be to persuade somebody to install EV charging facilities at their own expense and then *give away the electricity*. Both the tolling ban and the rest-area ban should have no part in a 21st century Interstate System. This change would also permit next-generation “rest areas” to become full-fledged service plazas like those on existing toll roads, offering all forms of refueling, ample safe overnight parking spaces for heavy trucks, shops and restaurants, etc.

In short, Committee’s report missed an important opportunity. Its research results could have been marshalled to support a plan to accomplish two major goals in one overall program: launching the national transition to mileage-based user fees *and* replacing the first-generation Interstates with a much-improved second-generation system. The key to doing both would be to use per-mile all-electronic toll revenues to underwrite revenue bonds for reconstruction and selective widening of the existing system—and its possible extension to metro areas that have developed since the 1950s but have no nearby Interstate access.

The report’s illustration of a 60% increase in federal gasoline and diesel taxes is misleading, since it is far less than would be needed to achieve the report’s aim of investing \$57 billion per year. Even a 60% increase is highly unlikely to gain traction in Congress. And if it did, it would be an unwise move for several reasons:

- It is not sufficient to handle the widening needed if 1.5% or 2% VMT growth materializes (which is likely if truck automation leads to essentially 24-hour long-distance trucking and a large increase in trucking’s share of goods movement).
- It does not include funding the replacement of the 100 largest interchange bottlenecks, which are largely responsible for \$74 billion per year in congestion costs to trucking alone.
- It is only a temporary solution, since nearly all projections show that fuel-tax receipts will soon begin a long decline over coming decades, due to ongoing

changes in vehicle propulsion. Increasing fuel tax rates can only postpone this decline temporarily.

And most important of all, it is a pipedream to imagine that Congress would allocate all of any proposed near-term increase in fuel-tax revenues to Interstate reconstruction. The federal surface transportation program encompasses 108 programs, nearly all of them supported by federal highway user tax revenues. Each of those programs has a constituency, and every one of those constituents will lobby hard for any increase to be spread proportionally among all 108 programs.

This Reason Foundation study makes the case for addressing both the need to rebuild the Interstates and the need to begin the transition from per-gallon fuel taxes to per-mile highway user charges. The key insight is that an electronically-collected per-mile toll *is a mileage-based user fee*, and one that already has wide customer acceptance. It explains why this country needs to face up to the real cost of building a better-performing Interstate System than the aging, outdated system we have now.

A number of states are already making plans to do toll-financed Interstate reconstruction and modernization. Connecticut has done three major studies and held extensive debates on whether and how to carry out such a program, probably using a provision of federal highway law that permits replacing non-tolled Interstate bridges with tolled bridges. Indiana has done two major studies, the second of which laid out a strategic plan to toll-finance the reconstruction of all its long-distance Interstates over several decades, also using the bridge provision. Virginia is debating a bill to use toll revenue to fund \$2 billion worth of improvements to I-81. Wisconsin has done an initial Interstates tolling feasibility study, and legislative leaders are pushing for a follow-on study similar to Indiana's strategic plan. In addition, both Alabama and Louisiana are considering toll-financed replacement of three aging bridges on I-10 in those states. Rhode Island is already tolling heavy trucks to help fund the replacement of 150 deficient bridges.

This Reason policy study closes with suggestions for how to make toll-financed Interstate reconstruction and modernization politically feasible and customer-friendly for both motorists and truckers. It suggests that in the 2020 surface transportation reauthorization law, Congress create a *voluntary program* that any state could opt into. In exchange for exempting it from the 1956 bans on tolling and commercial rest areas, the state would agree to configure the tolls as electronic per-mile charges as a first step toward *replacing* per-gallon taxes with per-mile charges. It would also commit to using the revenues solely

for both the capital and the operating and maintenance costs of the state's Interstate highways (no toll revenue diversion). And to ensure fairness for all users, the tolls would be charged to all vehicles, and there would be no differences in the rates charged to in-state and out-of-state vehicles. Participating states would have to enact enabling legislation agreeing to these provisions, while authorizing the state DOT to develop a multi-decade plan for modernizing all its Interstates.

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PART 1

INTRODUCTION

In September 2013, Reason Foundation released a major study arguing that the 48,000-mile Interstate Highway System is wearing out and needs to be replaced.¹ Based on conservative projections of traffic growth over the next three decades, the study identified specific urban and rural (long-distance) corridors that would need widening to handle future truck and personal vehicle travel. The study estimated the net present value of the cost of reconstruction and widening over a period of 25 years at \$983 billion. It also argued that, since there was little likelihood of a major new federal program to replace the first-generation Interstates, the most feasible way to accomplish this was for states to use revenue bonds to finance these projects, supported by revenues generated via all-electronic tolling of the rebuilt and modernized corridors.

While the report generated considerable media attention, some dismissed it as a call to “pave over America” at a time when they wanted freight to shift from truck to rail, and people to shift from driving to riding trains (such as a proposed nationwide high-speed rail system).

¹ Poole, Robert W., Jr. “Interstate 2.0: Modernizing the Interstate Highway System Via Toll Financing.” Policy Study No. 423. Reason Foundation, September 2013.

But since then, ongoing concerns over ever-increasing congestion, aging bridges, and the resurgent growth in vehicle-miles of travel (VMT) led Congress to call for a more-detailed study of the future of the Interstate System. The FAST Act, passed in 2015 to reauthorize the federal surface transportation program, asked the Transportation Research Board (TRB) to create an expert committee to study all aspects of this system of highways, with input from subject-matter experts and stakeholder groups. The 14-member TRB Future Interstate Study Committee, chaired by Norman Augustine, released its report in December 2018.² It presented a strong case for reconstructing, selectively widening, and potentially extending the system to urban areas that would have qualified in 1956 were they at their present size.

Part 2 of this new Reason Foundation study draws on the TRB report's findings to restate the case for replacing the aging first-generation Interstate System with Interstate 2.0. Subsequent sections discuss options for funding this set of transportation mega-projects, opportunities for making the new system customer-friendly, and alternative methods for procuring this set of mega-projects.

² Augustine, Norman (Chair). *Renewing the National Commitment to the Interstate Highway System: A Foundation for the Future*. Future Interstate Study Committee. Transportation Research Board. National Academies of Sciences, Engineering, and Medicine, December 2018.

PART 2

WHY THE FIRST-GENERATION INTERSTATES NEED TO BE REPLACED

2.1

AN AGING SYSTEM NEEDS MAJOR RECONSTRUCTION

The TRB Committee’s report makes no bones about the need for major reconstruction. On the first page of its chapter on “Emerging Challenges,” the first such challenge is “the need for a massive renewal of the system’s deteriorating foundations.” It goes on to explain that state DOTs, constrained by insufficient funding, have limited their investments to “repeated resurfacings,” which “produce diminishing returns over time” as the underlying foundation deteriorates. This results in higher life-cycle costs than the proper remedy of “full-depth reconstruction.” That term refers to breaking up the pavement and rebuilding the foundations, then replacing the pavement itself with newer, more-durable pavement designs. It also notes that “even the newest segments of the Interstate System will need to be rebuilt over the next 20 years.”

One reason the system has deteriorated to its current state is that the level of car and truck traffic using the Interstates is far greater than had been expected when the system began. Truck travel increased enormously once the Interstates were available, as the freight truck industry grew to unexpected proportions. Moreover, the report notes that “truck loads had grown to be much heavier than anticipated.” Altogether, the report concludes, “increased truck weights and traffic volumes greatly increased volumes on Interstate pavements,” leading to deterioration that was faster than projected.

Similarly, increased truck weights and volumes have imposed greater stress on Interstate bridges than had been forecast. The report notes that 35% of the 57,000 Interstate bridges are more than 50 years old. Fortunately, only about 3% of those bridges were rated as being in “poor” condition in the most recent US DOT “Conditions and Performance” report (based on 2012 data).³ But 56% of rural Interstate bridges and 53% of urban Interstate bridges are rated as in only “fair” condition. And a number of these bridges don’t have enough lanes for projected traffic.

2.2

CONGESTION IS A GROWING, UNSOLVED PROBLEM

In the same section on major challenges, the report calls for “expanding and managing urban system capacity.” It points out that, between 1980 and 2015, vehicle-miles of travel (VMT) on urban Interstates grew by 230%, while lane-miles increased by only 115% (and in some metro areas by far less). The result has been chronic peak-period congestion, which decreased slightly during the Great Recession, but has resumed growing thereafter.

It is not only commuters who pay a heavy price in wasted time and fuel. The report notes that “Trucks traveling on Interstates when hauling freight long distances are particularly affected by recurrent congestion on urban segments.”⁴ The report notes the trucking industry research arm issues regularly updated data on major truck bottlenecks, nearly all of which are on urban Interstates, mostly at or near obsolete interchanges built for much lower levels of traffic.⁵ The American Transportation Research Institute put the cost of congestion to the industry at \$74.5 billion in 2016, the latest year for which it has analyzed

³ Federal Highway Administration. “2015 Status of the Nation’s Highways, Bridges, and Transit: Conditions and Performance.” U.S. Department of Transportation, 2016.

⁴ Bureau of Transportation Statistics. *Freight Facts & Figures 2017*. “Chapter 4: Freight Transportation System Performance.” 2017.

⁵ “2018 Top 100 Truck Bottleneck List.” <http://atri-online.org/2018/01/25/2018-top-truck-bottleneck-list>.

data.⁶ The Committee's report sensibly recommends that urban freeway congestion be pursued "through a combination of physical expansion and efforts to manage demand," such as variably priced lanes.

2.3

MANY CORRIDORS NEED WIDENING

In its Chapter 5, the Committee's report draws on the US DOT's Highway Economic Requirements System (HERS) model that assesses proposed highway improvements in terms of benefit/cost ratios. Given the projections of traffic growth used in the Committee's research (between 0.75% and 2% per year, with a most-likely 1.5%), the report estimates that capacity expansion (lane additions) costing between \$13 billion and \$31 billion would be wise investments, depending on the actual VMT growth rate. This does not include the costs of replacing bottleneck interchanges, which the report acknowledges but does not seek to quantify. This chapter also discusses a number of worthwhile operational improvements such as ramp metering, integrated corridor management, adaptive speed limits, etc. which can also improve traffic flow on existing lanes. It also discusses dedicated truck lanes and variably priced express toll lanes. For some reason, it considers these two different kinds of new lanes as potential substitutes for one another, even though they serve different purposes and would mostly be added to different portions of the Interstate System. Cost estimates for such lanes (cited on page 5-33) are not included in the cost of the overall capacity-expansion recommendations.

2.4

THERE ARE NO ON-INTERSTATE SERVICES

The report's Chapter 4 discusses various uncertainties facing all of transportation in coming decades, including climate change, vehicle automation, and a number of others. On pages 36-37 it discusses trends toward increased use of non-petroleum propulsion methods. It notes a program developed by the Federal Highway Administration in cooperation with state DOTs, called the Alternative Fuels Corridors program. It identifies "highways that meet specified criteria for charging and fueling infrastructure." It notes that, as of March 2018, more than 80 Interstate Alternative Fuel Corridors had been designated in 44 states plus the District of Columbia. It also notes that Congress's definition of these Corridors specifies that the charging and fueling locations must be "not more than 5 miles from exit ramps" of those Interstates.

⁶ Lamb, Eleanor. "Congestion Creates \$74.5 Billion Burden for Trucking, ATRI Analysis Shows." *Transport Topics*. Oct. 18, 2018.

The report does not explain why these charging and fueling stations cannot currently be located *on the Interstate*, at what are called Interstate “rest areas.” That is because the 1956 law authorizing the original Interstate program prohibits all commercial activity at those rest areas (except for vending machines). Therefore, unlike America’s tolled Interstates (which were grandfathered into the system because they did not need federal funds to be built), which have full-fledged commercial service plazas and are beginning to add electric vehicle charging stations at them, the 94% of the Interstate System without tolls cannot offer alternative fueling or EV charging. Nor can they offer commercial services like safe, well-equipped overnight truck parking and amenities—a growing, unmet need now that federal Hours of Service rules for truck driver rest are being seriously enforced.

2.5

THERE'S A NEED FOR SOME NEW CORRIDORS

The Interstate System was approved by Congress in 1956, but the maps on which its corridors were based had actually been drawn in the 1940s by the Bureau of Public Roads, predecessor of FHWA. For this reason, the system reflected the America of the first half of the 20th century, when nearly all major economic activity took place east of the Mississippi. The largest cities in the western half of the country at that time were included for political reasons, but many of them were mere shadows of what they would become by the dawn of the 21st century—such as the huge metro areas of Las Vegas and Phoenix (which to this day lack an Interstate connection between them).

Hence, the Committee examined the possible expansion of the system to urban areas that would have qualified for inclusion in the original system had they been at their current size back in 1956. Its Table 3-2 lists 37 urbanized areas with populations over 50,000 that, as of 2017, lacked nearby access to any Interstate. Nearly half of those cities are in California and Texas, and most of the others are in other states of the South and West. The largest 17 have populations ranging from 114,000 (Monterey, CA) to 729,000 (McAllen, TX). The report notes that since this list was prepared, seven of the 37 urban areas were in the process of gaining access to a new Interstate corridor under development (e.g., I-69 under construction in Texas).

Another possible set of new corridors comprises routes that are critical to freight movement. In the ISTEA legislation in 1991, Congress identified 14 potential future freight corridors, two of them major north-south routes from the Canadian border to the Mexican border. One of these, I-15, has been completed, and the other, I-69, is being developed

state by state. The FHWA website includes the most recent list of Congressional High Priority Corridors, all of which are designated as future Interstates. The Committee's report makes no judgment about the cost-effectiveness of any of these corridors.

While acknowledging the potential for new corridors, the Committee's cost estimates for the second-generation Interstate System do not include such corridors. However, its Chapter 5 provides a cost estimate of \$10 million per mile for converting existing highways to Interstate standards (based on the recent experience with I-69). It cites FHWA criteria for such conversions and includes a list (in Table 5-9) of 150 miles of rural highway and 3,200 miles of urban corridors that would qualify; if all were converted, the cost would be about \$32 billion. This cost is not included in the report's suggested Interstate investments.

2.6

PROPOSED COST OF THE RECOMMENDED INTERSTATE REVAMP

In its Chapter 7, "Blueprint for Action," the report provides a summary table of its "estimated spending needs for Interstate highway renewal and modernization over the next 20 years." Three sets of cost estimates are provided, based on the three different estimates of annual VMT growth used throughout the report (modest at 0.75%/year; nominal at 1.5%; and high at 2.0%). Using only the "nominal" estimate, the following table reports the Committee's estimates and compares them to current (2014) spending levels:

Category	2014 Actual Spending	Proposed Annual Spending
Resurfacing and reconstruction	\$16B	\$29B
Bridge rehab/replacement	4B	4B
Lane additions	1B	22B
Operational improvements	<u>0.4B</u>	<u>2B</u>
Total	\$21.4B	\$57B

The corresponding annual totals if VMT growth is only "modest" would be \$46 billion per year, and if VMT growth is "high" would be \$69 billion per year. Any of the three totals would require huge new annual investments, for which there is no current funding source.

And those numbers do not capture the full need for a second-generation Interstate System, as documented in the report's chapters. The report's Chapter 7 also discusses "spending that will be required" but has been omitted since the Committee was unsure how to quantify it. This includes:

- Redesigning and rebuilding many of the system's 15,000 interchanges;
- Making the system more resilient to the effects of climate change;
- Expanding and improving urban Interstates via such techniques as express toll lanes; and,
- Extending the system via new corridors, as well as possibly replacing some urban segments.

The chapter notes in passing that these additional investments “are certain to require billions, and perhaps many billions, in additional spending.” Yet these additional costs could approach in magnitude the costs the report does quantify.

We will return to this subject in Part 4, but simply note here that other omissions include dedicated truck lanes in critically important long-distance freight corridors, service plazas on the rebuilt corridors, and larger investments to provide higher-quality pavement and meaningful reductions in congestion (as opposed to simply holding the line on current congestion levels).

PART 3

WHY A MAJOR FEDERAL TAX INCREASE IS NOT THE ANSWER

When the TRB Committee released its report, the headline news was the report's call to re-create the model used in the 1956 Eisenhower legislation. The new program would be called the Interstate System Renewal and Modernization Program (RAMP), with 90% federal and 10% state funding. The federal share would come from an increase in federal motor fuel taxes "to a level commensurate with the federal share of the required investment." There are several reasons why this is not realistic.

3.1

THE AMOUNT WOULD BE FAR TOO LARGE, POLITICALLY

Nowhere in the very long report is that new federal fuel tax rate specified. Table J-3 in Appendix J on funding and financing provides the rates that would be needed in 2026 to raise \$20 billion in that year (in current dollars). That table is reproduced here:

	Light Duty Vehicles (gas tax)	Combination Trucks (diesel tax)
Current rate (cents/gal.)	18.3	24.3
Required rate (cents/gal.)	29.9	39.7
Percent increase	63%	63%

However, in the body of the report, the annual amount needed each year under the “nominal” VMT growth rate of 1.5% per year is *\$57 billion per year*. That is 2.85 times the \$20 billion that would be raised by the increase shown in the table. The revised table shows the fuel tax rates that would be needed to actually raise the needed \$57 billion per year.

TABLE 1: REVISED FUEL TAX RATES, LIGHT DUTY VEHICLES AND COMBINATION TRUCKS

	Light Duty Vehicles	Combination Trucks
Current rate (cents/gal.)	18.3	24.3
Real required rate	85.2	113.1
Percent increase	360%	360%

Most political observers would judge a 63% increase in any tax rate to be a very unlikely proposition. But a 360% increase is essentially fantasyland.

Federal gasoline and diesel taxes have not been increased for 25 years. Underlying that 25-year hiatus is a widespread political impression that a fuel tax increase is simply a general tax increase, like any other. That was not the perception in 1956 when the original Interstate program was created. The newly authorized federal fuel taxes were seen, correctly, as highway user fees, since all the revenues were dedicated to construction of the new Interstate Highway System. But that purpose eroded over time. As the Committee report notes:

The original vision of Congress was that the HTF [Highway Trust Fund] would exist only temporarily until the Interstate program was completed. Over time, however, the HTF grew to cover a wide variety of programs beyond the Interstates, such that the Interstate Highway System currently receives only about 30 percent of total federal-aid to states for highways.

Moreover, total federal highway spending is well below the revenues from highway fuel taxes, since close to 25% of federal highway user tax revenue is spent on non-highway uses, including mass transit, sidewalks, bikeways, and recreational trails, as well as highway and motor carrier safety regulation.⁷ Thus, federal fuel taxes that were once widely viewed as user fees, being spent for the benefit of those users, can no longer be accurately seen as such.

⁷ Poole, Robert W., Jr. and Adrian Moore. “Restoring Trust in the Highway Trust Fund.” Policy Study No. 386. Reason Foundation, August 2010.

A similar evolution in uses of highway fuel taxes has also taken place to various degrees at the state level. A recent study calculated the average diversion of state fuel taxes to non-highway uses at 25%, with ranges among the 50 states from as high as 72% (Kansas) to as low as zero (Alaska, Missouri, and West Virginia).⁸ It is hardly surprising that many taxpayer groups and conservative think tanks and pundits generally oppose any increase in federal or state fuel taxes as “just another tax increase.”

3.2

A LARGE INCREASE IN FEDERAL FUEL TAXES IS UNLIKELY TO BE DEVOTED TO THE INTERSTATES

It is politically naïve to expect that a significant increase in federal gasoline and diesel taxes would be devoted solely or even mostly to the reconstruction and widening of the Interstates. As the TRB Committee noted, the federal Highway Trust Fund has become a valued source of money for a vast array of state and local transportation efforts. Prior to recent reforms, there were 120 federal highway and transit programs, nearly all funded by the highway user taxes. Following reforms in recent surface transportation bills, there are now only 108 federal surface transportation programs: 62 highway programs, 20 for transit, 20 regulatory (NHTSA and FMCSA), plus six of the Federal Railroad Administration.⁹ Except for the six FRA programs, nearly all the others are funded by federal highway user tax revenues. Every one of these 102 programs has a constituency that believes its program is highly valuable and probably under-funded. The prospect of a significant increase in the revenue that supports the Highway Trust Fund would very likely trigger significant political interest in dividing up the increased revenues among most or all of the 102 programs.

The \$20 billion per year highlighted (misleadingly) in the appendix of the TRB Committee’s report is far short of the \$57 billion stated as the annual need if VMT grows as expected. Even a fuel-tax increase that generated a total of \$20 billion would be unlikely to yield even half of that amount firmly dedicated to the second-generation Interstates program. And as the report’s own analysis makes clear, an additional \$10 billion a year would be a drop in the bucket compared with the real need. Remember that the nominal \$57 billion per year *excludes* rebuilding the major bottleneck interchanges, adding urban express toll

⁸ Edwards, Chris. “Highways and Gas Tax Diversions.” Cato Institute, Sept. 19, 2018. (<https://downsizinggovernment.org/highways-and-gas-tax-diversions>)

⁹ Davis, Jeff. “Current Federal Surface Transportation Programs,” text box in “How Has Federal Bridge Policy Changed Since the I-35W Bridge Collapse?” *Eno Transportation Weekly*, Week of Dec. 11, 2017. (<https://www.enotrans.org/article/federal-bridge-policy-since-i35w-collapse>)

lanes and rural dedicated truck lanes, and potential extensions of the Interstates to some of the newer urban areas lacking connections to the system.

3.3

THE FUEL TAX IS A DECLINING REVENUE SOURCE THAT NEEDS TO BE REPLACED

As the TRB report itself discusses at considerable length, while per-gallon fuel taxes in the 20th century generally reflected vehicle operators' use of highways, and kept pace with the growth in travel, most of the transportation community now understands that fuel taxes are beginning a long-term decline that will coincide with the several decades needed to rebuild and replace the first-generation Interstate System.

This conclusion was first reached by a TRB special committee in 2006, on which this author served.¹⁰ Congress subsequently appointed a national commission to identify the best replacement for per-gallon fuel taxes. After assessing a wide array of possibilities, the commission recommended a gradual transition from per-gallon taxes to per-mile charges, dubbed Mileage-Based User Fees (MBUFs).¹¹

In the years since then, Congress has authorized funding for a series of state-level and multi-state pilot projects to design and test various versions of MBUFs. A report on lessons learned from the various state pilot programs is being produced under contract to FHWA and is expected to be released in the first half of 2019.

A recent report by transportation consultant Ed Regan quantified the coming decline in fuel tax revenues on a national basis, as shown in Figure 1.¹² The steepness of the decline depends on (1) future miles-per-gallon (mpg) regulations imposed by the federal government and (2) the rate of market penetration of electric vehicles (which, of course, pay no fuel taxes). The top line in the graph is total fuel tax revenues if overall vehicle mpg remained constant (which it won't). The second line is the reference case projection from the Energy Information Administration, based on its 2017 assumptions on federal mpg standards and the market penetration of hybrid and electric vehicles. The lowest line on

¹⁰ Committee for the Study of the Long-Term Viability of Fuel Taxes for Transportation Finance. *The Fuel Tax and Alternatives for Transportation Funding*. Special Report 285. Transportation Research Board, 2006.

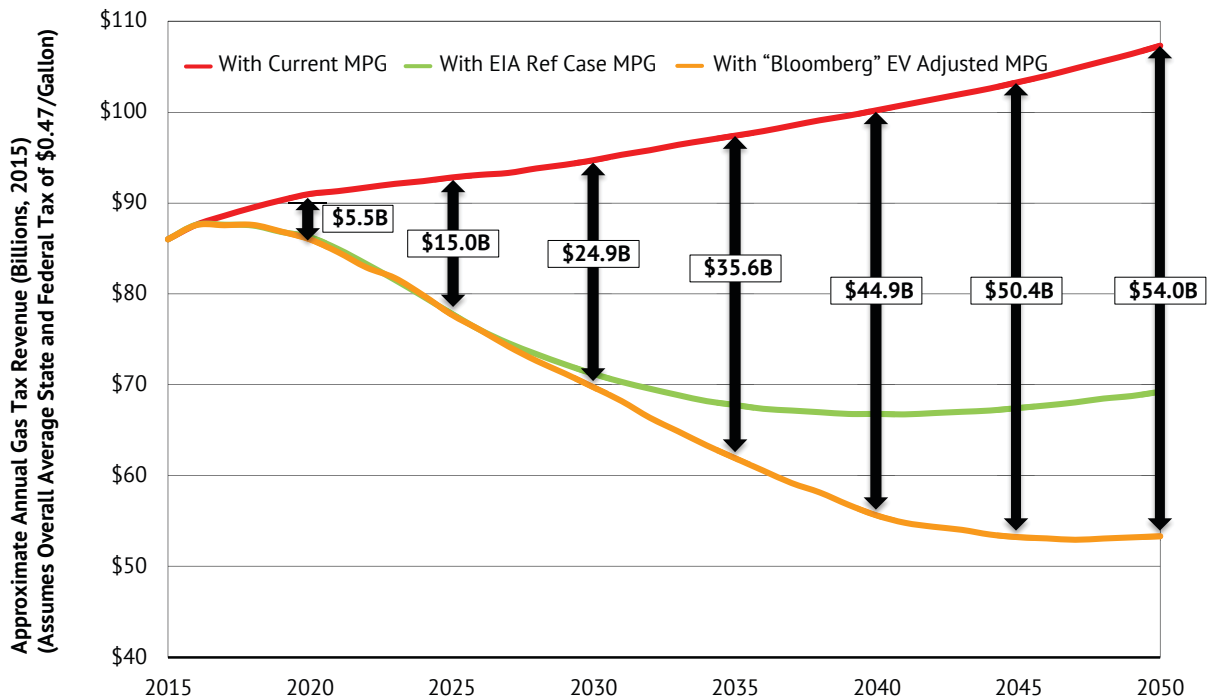
¹¹ National Surface Transportation Infrastructure Financing Commission. *Paying Our Way: A New Framework for Transportation Finance*. Washington, D.C., February 2009.

¹² Regan, Ed. "The Motor Fuel Tax: A Critical System at Risk." CDM Smith, 2017.

the graph is based on a more-aggressive projection of EV market penetration from Bloomberg New Energy Finance.

FIGURE 1: APPROXIMATE STATE AND FEDERAL FUEL TAX REVENUE

2017 DOLLARS; ASSUMES NOMINAL \$0.47/GAL. COMBINED AVERAGE TAX



Source: Regan, Ed. "The Motor Fuel Tax: A Critical System at Risk." CDM Smith. 2017. Note 12.

As can be seen, by 2040 (the end of the TRB report’s 20-year proposal) the shortfall in total fuel tax revenue could be as much as \$45 billion per year. Hence, just to maintain the current amount of annual revenue would require a massive increase in federal and state fuel tax rates by that point in time. And that would only support current Highway Trust Fund spending levels, *leaving little or no increase* for the report’s proposed Interstate reconstruction program.

3.4

PAY-AS-YOU-GO IS INFERIOR TO LONG-TERM FINANCING OF MAJOR INFRASTRUCTURE

Worldwide, in modern developed countries, major infrastructure is brought about via long-term financing based on the projected revenue stream from the facilities involved. Examples include airports, electric utilities, transmission lines, pipelines, railroads,

seaports, and water and sewer systems. Long-term financing (usually via issuing revenue bonds) means that a major new facility can be built now, all at once, since bond-buyers (and potentially other classes of investors) put up the cost up front, and are willing to be paid back over time from project-generated revenues. Political advocates of pay-as-you-go always point to the interest costs involved in bond-based financing as an unnecessary cost burden, but the trade-off is that large-scale infrastructure can be developed now and deliver its benefits to users much sooner, rather than either (1) being put off for decades until enough funds can be saved up or (2) built in dribs and drabs over many years, as some states are attempting to do with pay-as-you-go Interstate reconstruction.

There is no question that any large-scale effort to replace the aging Interstate 1.0 with a much better Interstate 2.0 will take several decades. Even with long-term financing, the scale is such that it could not possibly be completed all at once, even within a single state. Rather, each state DOT would have to assess the condition of each of its Interstate corridors and the need for lane additions and interchange replacements. This would lead to a several-decades plan to replace and upgrade individual corridors—and given the lengths of many of them, even replacing a single long-distance Interstate might have to be divided into several smaller projects. But the overall goal of replacing the entire old system with a new one could be fully accomplished over two or three decades. That is likely impossible with pay-as-you-go annual funding.

Chapter 6 of the TRB Committee’s report includes a discussion of “instituting mileage-based user fees for Interstate use to replace other user fees.” It notes that revenue from new Interstate MBUFs could be bonded, just as toll revenues on existing toll roads are bonded, to provide large sums of capital up front to finance major Interstate reconstruction and widening projects. It also notes that “a federally supported state-applied MBUF could one day replace motor fuels taxes and the [other] revenues used to support the Interstates,” but it does not recommend this approach.

Ironically, despite acknowledging that an Interstate mileage-based user fee revenue stream could be bonded against by a state (just like toll road bonding), the TRB Committee’s report envisioned this as a federally collected mileage charge that would be doled out to the states on an annual basis to be used for pay-as-you-go projects.¹³

¹³ Augustine. *Renewing the National Commitment to the Interstate Highway System*. 6-26.

PART 4

THE NEED FOR *IMPROVED* PERFORMANCE

A major multi-decade program to rebuild and modernize the Interstates ought to result in a system that *performs better* than the existing aged system. This should mean bridges that are mostly in “good” shape, with better pavement quality than today, and—in particular—significantly less congestion than is experienced today, both in urban areas and on long-distance corridors. Unfortunately, the program laid out in the Committee report, specifically its Chapter 5 on investment needs, does not really deliver that. On the chapter’s second page, the Committee acknowledges that “the dollar estimates presented herein can be viewed as minimums.” The discussion below expands on the consequences of this admission.

4.1

THE SLOW PACE OF BRIDGE IMPROVEMENTS

The report seems to be of two minds in discussing the need for improving aging bridges on the Interstates. In Table 5-1 it cites FHWA’s 2016 estimates of a \$44 billion backlog of needed bridge rehabilitation investment. Yet on page 5-18, the report asserts that “states are already devoting sufficient funds to continuing to maintain and improve Interstate

bridges.” So the report recommends simply a continuation of the current \$4 billion per year for bridge improvements. But the inventory of deficient bridges is not static. Every year, more bridges reach the stage of being defined as deficient, so spending \$4 billion a year for 11 years cannot reduce the deficient inventory to anything close to zero. This is not a responsible strategy for dealing with the deficient bridge problem.

In its detailed discussion later in the chapter, the report notes that, although concrete deck structures were designed for service lives of 30 to 50 years, “their lives were often shortened by exposure to heavy truck traffic.” In an earlier section, the report noted that, after the Interstates were opened to users, truck traffic increased at a far greater rate than had been expected, as basically a whole new trucking industry emerged and grew, winning significant market share from the railroads.

In recommending no real annual increases in bridge investment, the report’s authors failed to account for a critically important point. Research by DOT’s Volpe National Transportation Systems Center projects that, over the next 25 years, the rate of increase in truck traffic will be about twice as much as the increase in car (“light vehicle”) traffic.¹⁴ But the TRB report did not use separate projections of VMT for trucks and light vehicles. It used an *average* VMT growth rate for all kinds of vehicles. This almost certainly means an under-estimate of future truck traffic—and hence of ongoing bridge damage.

Between the under-estimate of likely future bridge damage from increased traffic and the leisurely pace of reducing the large backlog of bridge rehabilitation and replacement, inadequate bridges will likely remain in the Interstate System for the entire 20-year period the report discusses. In fact, they may even grow as a share of the backlog in spending necessary to modernize the system.

4.2 WORSENERD PAVEMENT CONDITIONS

Interstate highways, in general, are in better condition than most other highways. FHWA data cited in the report show that on average only 2% of Interstate-miles are rated as being in “poor” condition by the state DOTs that own and maintain the Interstates. Yet Table 5-7 in the report shows that after large-scale investment under any of the three VMT-growth

¹⁴ Pickrell, Don, David Price, Rachel West and Garrett Hagerman. “Developing a Multi-Level Vehicle Miles of Travel Forecasting Model.” Volpe National Transportation Systems Center, submitted to the Transportation Research Board Nov. 15, 2011.

scenarios, that fraction would double to 4% at the end of the 20-year period. According to the text on page 5-23, that is the best that can be accomplished if investment is made only in projects with a benefit/cost ratio greater than or equal to 1.0. If a more-stringent benefit/cost threshold of 1.5 were used, the amount of “poor” condition pavement after 20 years would grow to between 6% and 7% of Interstate-miles.

This seemingly bizarre result may be because the data and modeling tools used by FHWA (HERS and the Highway Performance Monitoring System) do not factor in the higher growth rate of truck VMT. It is widely understood that heavy trucks account for the lion’s share of pavement wear and tear.¹⁵ Hence, a modeling approach that took into account the additional damage from faster-growing truck traffic would likely have called for greater investment in pavement rehabilitation and replacement. As it is, asking Interstate users to pay for \$57 billion a year in investment to improve this system, only to have the amount of poor-condition pavement double, does not sound like a winning proposition.

4.3 SIGNIFICANTLY INCREASED CONGESTION

The same Table 5-7 also reports the annual hours of peak-period delay on Interstates in urbanized areas. After the 20-year period of major investments in rebuilding and widening the system, there would be a modest reduction in congestion only if VMT followed the “modest” 0.75% annual growth rate. Under that scenario, the average annual peak-period delay would decrease from 2.4 billion person-hours in 2014 to 1.8 billion person-hours in year 20 of the reconstruction period—a 25% reduction. That’s not trivial, but there would still be extensive congestion, especially in the largest 10 to 20 metro areas.

But the “modest” scenario is unlikely to materialize, especially since truck VMT will likely increase at twice the rate of light-vehicle VMT. In the “nominal” scenario of 1.5% growth in total VMT, congestion after 20 years would be *higher* than in 2014: 2.5 billion person-hours, 4% higher, after investing \$57 billion per year in Interstate modernization. That is not a pleasant outcome for motorists after that huge investment of Interstate users’ money.

Even worse is the result of the “high” VMT growth scenario based on 2% annual increase. In this case, Interstate users would face 3.1 billion person-hours of delay—29% worse than in 2014, and after investing \$69 billion a year in the second-generation Interstates.

¹⁵ Small, Kenneth A., Clifford Winston and Carol A. Evans. *Road Work: A New Highway Pricing and Investment Policy*, Chapter 3—“Pavement Wear and Road Durability.” The Brookings Institution, 1989.

One reason for these disappointing results is that the investment scenarios cover only pavement and bridge rehabilitation/replacement and some additional general-purpose lanes. The report's investment program does not include the redesign and replacement of any of the 100 major interchange bottlenecks documented regularly by the American Trucking Associations, which (as noted previously) cost the trucking industry alone \$74 billion per year. Only a handful of these bottlenecks have been redesigned and rebuilt over the past two decades. Table 2 lists several largest.¹⁶

TABLE 2: A SAMPLING OF THE LARGEST REBUILT BOTTLENECKED INTERCHANGES ON U.S. INTERSTATES, AND THEIR COST

I-95 Betsy Ross Interchange	Philadelphia	\$1.641 billion
I-94/I-894 Zoo Interchange	Milwaukee	\$1.549 billion
I-43/I-94 Marquette Interchange	Milwaukee	\$ 0.8 billion
I-95/I-495 Springfield Interchange	N. Virginia	\$ 0.676 billion

Source: U.S. DOT Build America Bureau, Major Projects Database. "Interchanges." (<https://www.transportationproject.org>, accessed Feb. 8, 2018).

Nor does the investment program include large-scale construction of networks of variably priced express toll lanes. The text does note that toll-managed lanes could have a significant impact, "reducing congestion by about one-third on corridors where they are deployed." But the report then dismisses such lanes as too difficult to build in the urban areas where most congestion occurs. This ignores plans and major projects under way in more than a dozen metro areas to develop express toll lane networks covering most or all of their freeway systems. For example, in northern Virginia, a long-term public-private partnership is fully financing the addition of 22.5 route-miles of express toll lanes being added to I-66 outside the Beltway, at a cost of \$3.5 billion. In Dallas and Fort Worth, similar projects have added elevated and depressed express toll lanes to freeways with limited right of way; the Dallas LBJ/I-635 project cost \$2.6 billion and the Fort Worth North Tarrant Express project cost \$3.7 billion.¹⁷ Table 5-6 in the report puts the 20-year cost of toll-managed lanes as between \$18 billion and \$64 billion (likely an under-estimate), depending on the VMT scenario. It also estimates the congestion reduction effect as

¹⁶ U.S. DOT Build America Bureau, Major Projects Database. "Interchanges." (<https://www.transportationproject.org>, accessed Feb. 8, 2018).

¹⁷ Poole, Robert W., Jr. "Annual Privatization Report: Transportation Finance." Reason Foundation, May 2018, Table 5.

between 29% and 34%. It is strange that such significant benefits did not lead to including express toll lanes in the second-generation Interstate System. Moreover, the report makes no mention of the revenues such lanes generate, which cover a large share of the cost of construction and all the costs of operations and maintenance, as in the three examples cited above.

PART 5

THE CASE FOR TOLL FINANCING

The title of this section includes two important concepts. The first is “toll,” meaning a direct user fee that is proportional to the amount that a vehicle drives on the road in question. If the toll is charged on a per-mile basis, *it could legitimately be considered a mileage-based user fee* (MBUF), which most transportation researchers agree is the needed replacement for per-gallon fuel taxes. The TRB Committee report is in general agreement on this proposition, at least in the longer term. The report also strongly supports the principle that highways should continue to be paid for by their users, in proportion to their use, rather than by general taxpayers.

The second concept is “financing.” Though often used interchangeably with “funding,” what financing means is to raise the capital needed for a project up front, and pay it off over time via contractually agreed payments. This is how nearly all Americans purchase their homes and most of their cars. It is also how nearly all major U.S. infrastructure is procured, whether by investor-owned companies (electric utilities, pipelines, telecommunications firms, etc.) or government agencies (toll authorities, municipal utilities, etc.). Financing enables major facilities to be obtained now, rather than decades in the future, as long as there is a reliable revenue stream to repay the investors. Financing is especially important in cases where there is a large backlog of needed projects, as is the case with the aging Interstate System. In a footnote on the first page of its chapter on “Investment Funding Options,” the TRB report notes that, in contrast with a financing approach, “The pay-as-you-

go approach means that construction would proceed only at the same pace as revenues were received.”

As noted in Part 2, the 2013 Reason Foundation Interstate 2.0 study found that toll financing would be feasible for rebuilding and selectively widening the Interstate System in all but six states. The TRB report cited this research, but did not embrace either tolls or financing.

5.1

ADVANTAGES OF TOLLING

5.1.1 TOLLING ENABLES LONG-TERM FINANCING, SO PROJECTS GET BUILT SOONER.

As noted above, there is a very large backlog of unmet needs on the Interstate System, and the benefits for motorists and truckers will be realized years or decades sooner if the numerous modernization projects are *financed* up-front, rather than being done over a much longer period of time via *pay-as-you-go funding*.

5.1.2 TOLL REVENUES CAN BE SAFEGUARDED AGAINST DIVERSION.

There is a long history of legal protection for those who buy toll revenue bonds. Revenues from the fuel taxes paid by highway users are often diverted to other forms of transportation and even to entirely non-transportation purposes. By contrast, toll revenues are generally pledged to debt service on the bonds, as well as to special accounts for maintenance and reserve funds (for any future years in which traffic and revenue might decline).

5.1.3 TOLLING IS INHERENTLY MORE FAIR TO HIGHWAY USERS.

Interstates are premium highways that cost more to build and maintain than ordinary highways and local roads. With a fuel tax system, all highway users pay for all roads, which means that all pay the *same rate per mile* in each state, even though the cost per mile (to build and maintain each roadway) is much higher for Interstates. The per-mile charges needed to build and operate Interstate 2.0 will have to be higher than the per-mile charge or charges needed for all of a state’s other roads (which are less costly to build and maintain). This is fair, both for those who are heavy users of Interstates (e.g., truckers) and those who make little or no use of Interstates. The TRB Committee’s report acknowledges

this point on page 6-12, stating that “the public may not accept a [fuel] tax policy that requires users of all roads and highways to pay disproportionately more for Interstate renewal and modernization relative to their use of the system.”

5.1.4 TOLLING CAN ENSURE PROPER MAINTENANCE.

Those who invest in toll roads (e.g., as bond-buyers) want to be sure that enough people use them to provide the promised annual debt-service payments. They know that if the tolled road is in bad shape, people will be less likely to pay tolls in order to use it. Therefore, bond-buyers insist that a high priority be given to using a defined portion of the toll revenue for ongoing maintenance. This is a legally enforceable provision. No such provisions exist in states to guarantee proper maintenance on non-tolled highways.

5.1.5 TOLL RATES CAN BE TAILORED TO PROJECT COSTS.

An Interstate built through the Rocky Mountains or across a major river will cost more to build and maintain than one built on flat terrain with few bridges. Accordingly, toll rates can be higher where roadway costs are significantly higher, which ensures that vital links get financed and built. This is not the case with one-size-fits-all fuel tax rates, which do not vary within a state and cannot be tailored to the needs of very expensive projects. Those projects often get deferred into the future, so that existing fuel tax funds can be spent on a larger number of smaller projects.

5.1.6 TOLLED PROJECTS ARE A GOOD FIT FOR INVESTOR-FINANCED PUBLIC-PRIVATE PARTNERSHIPS (P3S).

Rebuilding and modernizing the Interstates will require \$1 trillion to \$2 trillion worth of mega-projects over the next several decades. As has been well-documented, transportation mega-projects have a very poor track record, frequently experiencing large cost overruns, late completion, and less usage than had been projected.¹⁸ Toll-financed P3s have a growing track record of better performance, with the added advantage of shifting many of these risks from taxpayers to investors.¹⁹ Investor-financed projects also broaden the

¹⁸ Flyvbjerg, Bent, Nils Bruzelius and Werner Rothengatter. *Mega-Projects and Risk*. Cambridge University Press, 2003.

¹⁹ Geddes, Rick. *The Road to Renewal: Private Investment in U.S. Transportation Infrastructure*. The AEI Press, 2011.

financing base by including equity investment. Projects financed by a mix of debt and equity are better able to withstand traffic and revenue decreases due to recessions, since only the debt providers must receive payment every single year.

5.1.7 TOLLING PROVIDES A BUILT-IN MECHANISM FOR FUTURE IMPROVEMENTS.

As a country's economy grows, some states and metro areas grow faster than others, often in ways that were not predicted. Therefore, a robust funding and financing system needs to be capable of meeting needs for expansion caused by such growth. Had the original Interstates been financed via dedicated toll revenues, we would not be having a national debate about where to find the funding to rebuild, widen, and possibly extend this vital highway system. The dedicated revenue stream, including funding for guaranteed maintenance, would already be there. This difference is illustrated in Illinois, where the Illinois Tollway is proceeding with large-scale toll-financed Interstate reconstruction and widening, while Illinois DOT is not.

5.1.8 CONGESTION CAN BE REDUCED AND MANAGED VIA VARIABLE PRICING.

With the growth over the past two decades of variably priced HOT lanes and express toll lanes, we have seen that variable pricing can reduce congestion and increase hourly vehicle throughput on expressway lanes. Variable tolling is an important optional feature of electronic tolling, available where it makes sense to use it.

5.2

CONCERNS ABOUT TOLLING

5.2.1 TOLL BOOTHS AND TOLL PLAZAS POSE SAFETY, CONGESTION, AND POLLUTION RISKS.

Those points were certainly true of 20th-century toll booths and plazas. But today's all-electronic tolling is rapidly eliminating toll booths, toll plazas, and cash tolling. Any program to rebuild and modernize a state's Interstate highways would make use of customer-friendly, highway-speed all-electronic tolling, which has become the standard for all new tolled projects.

5.2.2 TOLLING IS LESS POPULAR THAN FUEL-TAX INCREASES.

If a survey asks people “Would you like to pay tolls?” most will answer no. But if the question put to people is how to pay for a major new highway or bridge (including the replacement of an aging, obsolete one), and they are given four or five funding options, tolls nearly always emerge as the least-bad choice. As the TRB report notes on page 6-13, a 10-year review of polling data carried out by the National Cooperative Highway Research Program (NCHRP) confirmed this overall finding.²⁰ This result was also confirmed in a 2018 national public opinion survey in which 46% of respondents said they would be willing to pay tolls to get relief from congestion, compared with only 27% favoring higher taxes.²¹ This was also the finding of a public opinion poll done by CDM Smith as part of its study of possible tolling of I-95 in Connecticut. Choosing between new taxes or tolls to pay for highway improvements, tolls won by 59% to 34%.²² The underlying reason is easy to understand. With any of the tax options, the voter can be sure of only one outcome: she will pay more taxes. With the toll option, she will only have to pay a new toll if it produces a roadway or bridge that she can actually use and provides a service equal to or worth more than the cost of the toll.

5.2.3 TOLLS COST A LOT MORE TO COLLECT THAN FUEL TAXES.

The conventional wisdom is that toll collection eats up 20% to 30% of the toll revenue, whereas the cost of collecting fuel taxes uses only about 1% of the revenue. This was in the right ballpark for 20th century cash tolling, but is no longer the case with 21st century all-electronic tolling. Two research reports questioned both parts of this assertion. A 2008 NCHRP study found that, after taking into account losses due to fuel tax evasion and other factors, the actual cost of collecting fuel taxes is 2% to 3% of the revenue.²³ Another study pointed out that the growing use of all-electronic tolling is dramatically reducing the cost of toll collection. As noted on page 6-13 of the TRB report, “Fleming and colleagues (2012) argue that toll roads using current all-electronic tolling (and only allow[ing] payment by

²⁰ Zmud, Johanna and Carlos Arce. *Compilation of Public Opinion Data on Tolls and Road Pricing*, NCHRP Synthesis 277. Transportation Research Board, 2008.

²¹ “Americans Will Pay Higher Tolls and Taxes for Infrastructure Improvements, Says HNTB Survey.” *Traffic Technology Today*. Oct. 16, 2018.

²² Ed Regan. CDM Smith, email to the author on Feb. 5, 2019.

²³ Balducci, Patrick, Gang Shao, Albert Amos and Anthony Rufolo. *Costs of Alternative Revenue-Generating Systems*. NCHRP Report 689. Transportation Research Board, 2008.

credit card) have reduced collection costs to 5%” of revenue.²⁴ Trucking firms that use nationwide electronic tolling invoicing provided by Bestpass and PrePass Plus are already paying closer to 1% of revenue for toll collection,²⁵ while toll agency costs for dealing with those service companies are estimated at another 1% of revenue.²⁶

5.2.4 TOLLING INFRASTRUCTURE INCREASES A HIGHWAY'S CONSTRUCTION COST.

The reconstruction of an Interstate corridor will indeed cost somewhat more than if it were not tolled, thanks to the need for gantries and other all-electronic tolling equipment. The Reason Foundation Interstate 2.0 study used Fleming's estimate of \$250,000 per mile for rural Interstates and \$2.5 million per mile for urban Interstates. That would total about \$55 billion for the entire system, but it is a very small fraction of the total reconstruction and widening cost of \$1 trillion to \$2 trillion; at a total cost of \$1.5 trillion, the tolling system's additional cost would be .07%—less than a rounding error.

5.2.5 IT'S UNFAIR FOR PEOPLE TO PAY BOTH FUEL TAXES AND TOLLS FOR THE SAME HIGHWAY.

This is a completely reasonable point, and one that is easily addressed. If the toll rates are sufficient to cover the capital and operating costs of the rebuilt Interstate, then it is unfair to also charge the toll-payers a fuel tax. The basic idea of replacing per-gallon taxes with per-mile charges is that the charge *replaces* the tax. Therefore, as long as fuel taxes remain in place, motorists and truckers using tolled, rebuilt Interstates, must be given rebates of the fuel taxes charged for using that Interstate segment. Fuel-tax rebates can easily be calculated by the electronic tolling software, based on the known miles-per-gallon rating of each toll-paying vehicle.²⁷ The TRB report notes this point on page 6-14.

²⁴ Fleming, Daryl, Thomas McDaniel, Ramon Grijalva and Luis Alberto Sanchez-Ruiz. “Dispelling the Myths: Toll and Fuel Tax Collection Costs in the 21st Century.” Policy Study No. 409. Reason Foundation, October 2012.

²⁵ Poole, Robert. “Truck-Friendly Tolls for 21st Century Interstates.” Policy Study No. 446. Reason Foundation, July 2015.

²⁶ Personal communication to the author from Ed Regan of CDM Smith, Feb. 11, 2019.

²⁷ Poole, Robert W., Jr. “Can Interstate Tolling Be Politically Feasible? A Customer-Friendly Approach.” Policy Brief. Reason Foundation, March 2018. 7.

5.2.6 TOLL REVENUE WILL BE DIVERTED TO OTHER USES.

This is a legitimate concern of highway users. At least a dozen large toll agencies divert large sums of toll revenues to other uses. For example, until a 2016 victory in a legal challenge by the trucking industry, the New York Thruway routinely diverted toll revenue to support the state's canal system, which does not benefit toll-payers. (Unfortunately, that decision was overturned by a federal appeals court in 2018.) In 2007, the Pennsylvania Legislature required the Pennsylvania Turnpike to divert \$450 million per year to the state DOT to use for local transit systems around the state. There is no benefit to Turnpike users from the significantly higher tolls the agency has had to charge in order to make those annual payments. And in 2018, the Indiana Toll Road instituted a large increase in truck toll rates to provide money that the state plans to use mostly on other highways statewide. The Owner-Operator Independent Drivers Association (OOIDA) has filed suit to reverse that change. As a condition of granting federal permission for Interstate tolling, Congress should forbid states from diverting toll revenue to non-Interstate purposes.

5.2.7 MANY TRUCKS AND DRIVERS WILL DIVERT FROM A TOLLED HIGHWAY TO PARALLEL ROUTES.

This is also a legitimate concern, since cars and large trucks might overcrowd parallel highways, and the trucks might cause significant pavement damage. States have several ways to reduce such diversion. First, those who carry out investment-grade toll road traffic and revenue studies know that the lower the toll rates, the less the traffic diversion. Therefore, one way to reduce traffic diversion is to avoid charging high tolls that generate funds for revenue diversion (as in New York and Pennsylvania); in other words, *forbidding revenue diversion* yields lower toll rates that will *reduce traffic diversion*. Second, highways should not be tolled via only occasional toll barriers, which encourages drivers to get off in advance and return once they are past the barrier. Instead, they should charge tolls from each on-ramp to each off-ramp. Third, on parallel roads not designed for heavy trucks, states should enforce weight limits. These measures will reduce, but not eliminate, traffic diversion.

5.2.8 SOME STATES WILL DISCRIMINATE AGAINST OUT-OF-STATE INTERSTATE USERS.

This is also a genuine concern, since some states that are considering Interstate tolling are pondering such policies. For example, in its plan to toll I-81, Virginia is weighing whether to permit frequent personal-vehicle users to purchase an annual pass that costs only \$30,

under which those (nearly all in-state) drivers would pay a tiny fraction of the 10 cents/mile toll that identical vehicles from out of state would pay to traverse I-81. Other states are considering border tolls, or exemptions from tolls for those traveling only a small number of miles. Rhode Island is charging tolls only to heavy trucks. Such policies appear to conflict with the flow of interstate commerce, if not *per-se* unconstitutional, and should be forbidden by Congress as a condition of allowing states to make use of Interstate tolling.

5.2 9 ELECTRONIC TOLLING VIOLATES PRIVACY.

With electronic tolling (unlike cash tolling), the toll road operator knows the identity of the vehicle and its owner. This leads individual motorists to fear that the information collected could be used for purposes such as speed limit enforcement or even identifying certain trips relevant to divorce cases. Trucking operators may fear that routing and service patterns identifiable from tolling data could find its way to competitors. States are responsible for enacting electronic records privacy laws, and a nationwide expansion of electronic tolling may require additional privacy protections to be adopted. Two services that provide electronic toll billing to trucking companies—Bestpass and PrePass Plus—have a long track record of maintaining the confidentiality of trucking data.²⁸

²⁸ Poole. "Truck-Friendly Tolling." 20.

PART 6

INTERSTATE TOLLING AS THE FIRST STEP TOWARD REPLACING FUEL TAXES

6.1

HOW THE TRB REPORT ASSESSES MILEAGE-BASED USER FEES

In a number of places, the TRB report explains that fuel taxes are becoming not only less effective and reliable as a funding source, but also less fair as a highway user fee. For example:

Fuel tax revenues are becoming increasingly decoupled from highway use, both because of rising vehicle fuel economy in general and increased use of electric power and alternative 'fuels' that are not now subject to federal taxes for transportation purposes.... Whereas these erosion effects are gradual and small on an annual basis, they become quite substantial over the span of a decade or more.²⁹

Despite acknowledging this increasingly dire situation beyond the next decade, the report goes on to recommend a 20-year Interstate reconstruction and modernization program based on greatly increased federal fuel taxes. The report also notes that "it can be difficult

²⁹ Augustine. *Renewing the National Commitment to the Interstate Highway System*. 6-9.

to assure that the revenues from the [fuel] tax will be spent on the road systems where most of the fuel combustion took place” (page 6-10). It also notes that the current diesel tax over-charges diesel-powered pickup trucks and vans while seriously under-charging heavy highway trucks.

Its chapter on “Investment Funding Options” includes a section on Tolling as well as a *separate* section on Mileage-Based User Fees, despite initially describing MBUFs as “a type of toll.” The section on MBUFs reminds readers that the Infrastructure Financing Commission in 2009 recommended MBUFs as the best replacement for fuel taxes, and describes MBUFs as “similar to tolls but without tollbooths.” That statement essentially says that all-electronic tolls *are mileage-based user fees*. The discussion also agrees that MBUF revenues could be bonded in order to finance major projects such as Interstate reconstruction and widening. And it states that “A federally supported, state-applied MBUF could one day replace motor fuels taxes and the revenues currently used to support the Interstates.”

Rather than evaluating the pros and cons of this straightforward approach, the rest of the section on MBUFs focuses on a more-complex proposal made in 2011 by Schenendorf and Bell. Sensibly, it would place electronic tolling equipment at every on-ramp and off-ramp, to charge each vehicle for the actual number of miles it drives.³⁰ But this proposal also called for all trucks (but not cars) to be equipped with GPS devices to charge them for using all other roads (to prevent trucks diverting to avoid tolls). Also, the MBUF they envision would be collected by the federal government and parceled out to state governments for Interstate projects, “allocated in a fashion similar to the present federal-aid system.” Revenues collected from trucks operating on non-Interstates would be used to fund freight intermodal projects. The authors assume that all existing user fees [fuel taxes] would be continued, violating the basic premise of MBUFs as the *replacement* of per-gallon taxes, rather than being an additional funding source. Moreover, this proposal would continue pay-as-you-go funding via annual disbursements from Congress to the states, thereby foregoing the benefits of long-term financing.

In discussing the pros and cons of this proposal, the report cites significant potential for politicization during allocation of this new money. “Given the great diversity within the country, designing a fee that would vary by geography and be adjusted annually and be perceived as fair and equitable, while also generating significant revenue, would be a

³⁰ Schenendorf, Jack and E. Bell, “Modernizing U.S. Surface Transportation System,” *BNA Daily Report for Executives*, 141 DER B-1, 2011

challenge for any organization,” it says (page 6-20). And it adds that the “composition of the proposed independent rate-setting body and the appointment process could be highly charged, politically.” It notes that, if Congress retained the right to review and veto the authority’s decisions, as it does with the Postal Regulatory Commission, “the process could potentially be almost as difficult as approving fuel tax increases.”

6.2

AN ALTERNATIVE PROPOSAL THAT ADDRESSES TWO PROBLEMS SIMULTANEOUSLY

The TRB report focused on an overly complex MBUF proposal and dismissed it in favor of re-creating the 1956 model of mostly fuel tax funding. But a far simpler approach would address highway transportation’s two largest problems simultaneously:

- Paying for reconstruction and modernizing the Interstate highways; and,
- Beginning the transition from per-gallon to per-mile funding.

The alternative the Committee missed is federal permission and guidance to the states to finance the reconstruction and modernization of the Interstates using the revenues from per-mile all-electronic tolling. Because the Interstates handle 25% of the country’s vehicle-miles of travel using just 5% of total highway lane-miles, completion of this program would be a large-scale start of the needed transition from per-gallon taxes to per-mile charges. It would do this by offering Interstate users a far better 21st century system to replace the aging and inadequate 20th century Interstates.

The program would be *voluntary*, since both Interstate tolling and MBUFs are departures from the status quo and likely to be politically controversial. That’s why it would be wise to enable states where political and public support for such a transition can be assembled to proceed to do so. States that succeed in gaining such support, and financing their first few projects, will serve as pathfinders for other states, showing them what worked and did not work. The states that lead the way will gain a near-term competitive advantage by offering Interstate users brand-new pavement and bridges with increased capacity—and hence less congestion. The new Interstates should also have multi-function commercial service plazas, offering motorists and truckers refueling/recharging, food and beverages, safe overnight truck parking (with electricity hookups), and other amenities.

Since most states will still have state fuel taxes in place during the early stages of Interstate reconstruction, rebates will be provided for the fuel taxes incurred for the miles

driven on the new and newly-tolled Interstates, consistent with the basic premise that the MBUF is to be a *replacement for*, not an addition to, fuel taxes.

This program will be *state-led*, rather than federally-led, for several reasons. First, the states own and operate the Interstates and are responsible for their condition and performance. Second, the likelihood of Congress enacting a several-hundred-percent fuel tax increase and allocating all of the increase to the Interstates is very close to zero. Moreover, a federal MBUF offered in addition to current federal fuel taxes would be even more politically radioactive than just a federal fuel tax increase.

PART 7

GROWING STATE INTEREST IN INTERSTATE TOLLING

7.1 THE UNUSED FEDERAL PILOT PROGRAM

“What if they gave a party and nobody showed up?” That’s been the reaction of various political commentators to the current three-state federal pilot program on toll-financed Interstate reconstruction. That program is very limited and has failed to yield any projects. When the three states that applied for and received the only three slots in the program failed to get anywhere close to making use of their slots, Congress implemented a use-it-or-lose-it provision in the FAST Act. Under that provision, all three states failed to take needed actions by the deadline. Moreover, only one state has applied for any of the available slots in the revised pilot program.

The program was inherently flawed from the outset. By permitting a state to toll-finance the reconstruction of only one Interstate, it created a political dynamic under which those living near or making use of the designated Interstate asked why they alone were being singled out to pay Interstate tolls. That created serious political opposition in North

Carolina and Virginia, both of which had proposed I-95. In Missouri (for aging I-70), neither tolling legislation nor the needed constitutional amendment was enacted.

The limitation to a single Interstate corridor prevented the state DOT from devising a credible plan to reconstruct and widen all the state's Interstates, prioritized by a combination of age/condition and current/projected traffic growth. That kind of plan would have treated all Interstate users alike, with the first corridor(s) rebuilt being the ones where large-scale investment was clearly the most urgently needed.

In addition, the limitation of the program to three states was also seen as a problem. For example, in North Carolina it was feared that if only that state tolled I-95, industry might prefer to locate in South Carolina or Virginia, where access via I-95 would not require paying tolls.

7.2

INTERSTATE TOLLING NOW MOVING FORWARD

The last several years have seen growing interest by legislators and state DOTs in toll-financed Interstate modernization. States have commissioned large-scale feasibility studies, and legal experts have pointed out two existing alternatives to the failed pilot program.

One existing alternative is to replace non-tolled bridges on an Interstate with tolled bridges. This provision was added to the law by Congress in 1998 legislation, but until recently was little-used. Rhode Island, which has the largest fraction of deficient bridges in the nation, came up with the idea of using that provision to toll-finance the rehabilitation or replacement of 150 structurally deficient bridges, mostly on the state's Interstates. FHWA approved the resulting RhodeWorks program in 2016, despite the fact that tolls are being charged only to heavy trucks (which has led the American Trucking Associations to file suit on constitutional grounds of discriminating against trucks in interstate commerce).³¹

The other existing alternative is FHWA's Value Pricing Program, which began via the 1991 ISTEA legislation. Under its provisions, a participating state may charge variable tolls on all lanes of an Interstate in order to reduce congestion. Thus far, no state has done that, with all current uses being either conversion of existing HOV lanes to priced HOT lanes or the

³¹ "ATA Sues Rhode Island Over Unconstitutional Truck Toll Program." American Trucking Associations, July 10, 2018.

construction of new express toll lanes on congested freeways. However, during 2018 policymakers in Oregon agreed to apply to FHWA under the Value Pricing Program to put variable tolls on all lanes of I-5 in the Portland metro area. The toll revenues will not be used for reconstruction or widening, but will supplement existing transportation revenues.

Other states looking seriously into Interstate tolling for reconstruction and potential widening include Connecticut, Indiana, Virginia, and Wisconsin. Replacing aging Interstate bridges with toll bridges is under serious discussion in Alabama, Louisiana, and probably several other states. Here is a brief recap.

Connecticut has engaged in a series of detailed studies over the past six years on tolling as a way to pay for both reconstruction and selective widening of its aging Interstates. Connecticut's I-95 was built originally as the toll-financed Connecticut Turnpike, from the New York State line to the Rhode Island border. The state commissioned congestion-relief studies of both the I-95 and I-84 in 2016³² and a tolling options study in 2018.³³ That same year, new Governor Ned Lamont campaigned on the tolls being charged only to trucks, but his transportation transition team has supported tolling all vehicles, which Lamont endorsed in February 2019. It would likely use some combination of the bridge-replacement provision and the Value Pricing Program.

Indiana's legislature has commissioned two major studies on Interstate tolling. The first (2017) made a detailed examination of the feasibility of tolling and the potential revenue that could be raised by tolling each of the state's rural (long-distance) Interstates.³⁴ The follow-on study (2018) created a statewide strategic plan based on using the bridge-replacement provision in federal highway law.³⁵ Both studies envisioned that all vehicles using the rebuilt Interstates would pay tolls.

Virginia DOT proposed a partially toll-financed plan in 2018 for \$2 billion worth of improvements to much of I-81, a major 325-mile truck route across the state. Though originally based on tolling only trucks, the plan submitted to the legislature calls for all

³² CDM Smith. "Connecticut I-95 Corridor Congestion Relief Study" and "Connecticut I-84 Corridor Congestion Relief Study." Connecticut Department of Transportation, 2016.

³³ CDM Smith. "Connecticut Tolling Options Evaluation Study." Connecticut Department of Transportation, 2018.

³⁴ HDR, Inc. "Tolling Feasibility Study." Indiana Department of Transportation, Oct. 31, 2017.

³⁵ HNTB. "Statewide Interstate Tolling Strategic Plan." Indiana Department of Transportation, November 2018.

vehicles to pay tolls, with proposed rates of 10 cents/mile for light vehicles and 15 cents/mile for heavy trucks. However, it also would permit Virginia residents to pay \$30 per year for unlimited use of I-81—a provision likely to be challenged on interstate commerce grounds. (As this report was being finalized, the tolling provision was removed from the I-81 bill.)

Wisconsin's legislature commissioned a major study of Interstate tolling in 2016. The set of reports, submitted to Wisconsin DOT in December of that year, included one report assessing the legal, political, and operational feasibility of tolling in Wisconsin,³⁶ and a companion study assessed potential traffic and revenue.³⁷ These reports did not assess the need to reconstruct or widen Wisconsin's Interstates, or whether the projected toll revenues would be sufficient to finance such projects. In 2018, the legislature passed a bill for a follow-on study, but it was vetoed by Gov. Scott Walker. A new governor took office in January 2019, but his position on tolling is not yet known.

Both Alabama and Louisiana are considering tolled bridges to replace aging bridges on the Interstate System. In Alabama, a \$2 billion project is nearing approval to replace the aging I-10 bridge over the Mobile River and the adjoining 12-mile Bayway. Officials in Louisiana are considering a \$500 million project to replace the existing I-10 bridge across the Mississippi near Baton Rouge and a \$1 billion project to replace an I-10 bridge near Lake Charles. Thus, there is now increasing interest by state governments in making use of tolling and toll financing, as the reality of future declines in fuel tax revenue sinks in.

³⁶ HNTB. "Feasibility of Interstate Tolling: Policy Report." Wisconsin Department of Transportation, Dec. 30, 2016.

³⁷ HNTB. "Feasibility of Interstate Tolling: Traffic and Revenue Summary Document." Wisconsin Department of Transportation, Dec. 30, 2016.

PART 8

HOW TO MAKE INTERSTATE 2.0 CUSTOMER-FRIENDLY

To build a critical mass of public (motorist and trucker) support and the needed political support, the change to the new model must *add value* for those asked to pay the new tolls. In a previous document, Reason Foundation laid out a set of “value-added tolling principles.”³⁸ Some of these provisions should become conditions for federal approval of a state’s request to use all-electronic tolling to generate the revenues to finance Interstate reconstruction and modernization. Others should be included in state legislation to ensure that Interstate modernization would be of genuine benefit to Interstate highway users.

To make tolling customer-friendly for all Interstate users, in the next surface transportation reauthorization bill (due in 2020) Congress should repeal the 1956 ban on tolled general purpose lanes and the 1956 ban on commercial services at Interstate rest areas, *subject to* the following conditions:

1. Tolls must be collected electronically and charged per mile traveled. (*This begins the transition from per-gallon to per-mile.*)
2. Tolls on a segment would be charged *instead of* fuel taxes, meaning fuel-tax rebates would be required. (*This reinforces the transition from per-gallon to per-mile.*)

³⁸ Poole. “Value-Added Tolling: A Better Deal for America’s Highway Users.”

3. Toll revenues would be used only for the capital and operating costs of the state's Interstate highways, bridges, and tunnels. (*This prevents tolled corridors from being used as cash cows.*)
4. Tolls on a segment would begin only after that segment is reconstructed or replaced and opened to traffic. (*This ensures users pay only for something better than the status quo.*)
5. Tolls must apply to all vehicles using the rebuilt Interstate. (*This prevents discrimination against trucks, and is fair, since all vehicles will benefit from the rebuilt Interstates.*)
6. For a given category of vehicle, tolls must be the same, for in-state and out-of-state Interstate users. (*This ensures no economic constraints on or discrimination in interstate travel and commerce.*)

A governor and legislature would be wise to reaffirm those principles via state enabling legislation. That legislation should *also* include:

- A request to FHWA for tolling authority for all the state's Interstates, subject to all six of the above conditions.
- Authorization for the state DOT to develop a several-decades plan and budget estimate for toll-financed reconstruction and modernization, based on both pavement and bridge conditions and the extent of current and projected congestion.
- A decision on the extent to which state-based toll agencies (if any) or long-term public-private partnerships would be used to finance, design, build, operate, and maintain the rebuilt and modernized corridors.

In September 2015 this author made an invited presentation on value-added tolling principles to the national board of AAA, the nation's largest highway user organization. That presentation discussed policies 2, 3, and 4 as key provisions of value-added tolling. They were endorsed by the AAA board as sound policy for AAA and its state affiliates.

PART 9

CONCLUSION

America's most important highways face major challenges. Our Interstate highways—which handle 25% of all personal and commercial vehicle-miles of travel—are wearing out. Many also have obsolete interchanges in urban areas and lack enough lanes to handle current and projected growth in travel in coming decades. Moreover, the primary highway funding sources—federal and state fuel taxes—are running out of steam due to ever-higher federal fuel-economy regulations and the increasing market penetration of hybrids and all-electric vehicles.

A major step toward addressing both of these challenges would be federal authorization for willing states to use toll financing to rebuild and modernize their aging Interstates. This would require no new federal funding—and indeed, as states took advantage of this option, it would free up a large portion of existing federal and state fuel taxes for a backlog of unmet transportation needs on *non-Interstate* facilities.

To ensure that Interstate tolling is implemented fairly to all Interstate users, Congress should condition its tolling permission on states agreeing to customer-friendly policies, such as those outlined in Part 8. Those policies should ensure that the new Interstate tolls are charged per mile driven, are collected electronically, and are not charged in addition to current fuel taxes on the newly tolled corridors. These policies will ensure that the Interstates become the proving ground for the nation's transition to mileage-based user fees.

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—the world's first express toll lane project. Over 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*, was published by the University of Chicago Press in July 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. For more than two decades he wrote a monthly column on transportation policy issues for *Public Works Financing*. He edits the monthly Reason Foundation 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.

