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Rebuilding and Modernizing Wisconsin's Interstates with Toll Financing

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Reason Foundation

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About the Author

Robert W. Poole, Jr. is the director of transportation policy and Searle Freedom Trust Transportation Fellow at Reason Foundation, the free market think tank he founded. Poole, an MIT-trained engineer, has advised the previous four presidential administrations on transportation and policy issues.

In the field of surface transportation, Poole has advised the Federal Highway Administration, the Federal Transit Administration, the White House Office of Policy Development, National Economic Council, Government Accountability Office and state DOTs in numerous states.

Poole's 1988 policy paper proposing privately financed toll lanes to relieve congestion directly inspired California's landmark private tollway law (AB 680), which authorized four pilot toll projects including the successful 91 Express Lanes in Orange County. More than 20 other states and the federal government have since enacted similar public-private partnership legislation. In 1993, Poole oversaw a study that coined the term HOT (high-occupancy toll) Lanes, a term which has become widely accepted since.

California Gov. Pete Wilson appointed Poole to the California's Commission on Transportation Investment and he also served on the Caltrans Privatization Advisory Steering Committee, where he helped oversee the implementation of AB 680. In 2008 he was appointed by Texas Gov. Rick Perry to that state's Legislative Study Committee on Private Participation in Toll Projects. He is a member of the Transportation Research Board's Congestion Pricing Committee and Managed Lanes Committee and is on the board of the Public Private Partnerships division of the American Road & Transportation Builders Association. He edits the Reason Foundation e-newsletter *Surface Transportation Innovations* and writes a monthly column for the newsletter *Public Works Financing*.

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Executive Summary

Wisconsin's 743 miles of Interstate highway are the most valuable component of the state's transportation system. With less than 1% of state roadway miles, the Interstates (including the southeastern Wisconsin freeway system) carry 18% of all vehicle miles of travel and 21% of all heavy truck traffic.

All highways wear out over time, despite ongoing maintenance. Over the next 30 years, most of Wisconsin's Interstate system will exceed its nominal 50-to 60-year design life and will need complete reconstruction. When that point is reached, it makes sense to update designs to current safety and operational standards, as was done recently in the reconstruction of the Marquette interchange. And in corridors where demand is projected to exceed capacity, resulting in heavy congestion, it makes sense to add lanes.

This study estimates the cost of a program of reconstructing and modernizing Wisconsin's Interstates over the next 30 years. For the rural Interstates, which are especially critical for goods movement, the (build-year) cost totals $12.5 billion. This estimate takes into account recent unusually high highway construction cost inflation and a more moderate estimate of future cost inflation. For the southeastern freeway system's reconstruction, the comparable cost estimate is $13.7 billion.

Wisconsin already has a $1 billion per year highway funding gap. The total $26.2 billion cost of this Interstate program is far beyond the ability of current transportation funding sources to handle. Federal and state fuel tax revenues, the largest source of transportation funding, are in long-term decline in real, or inflation-adjusted, terms, and a portion of Wisconsin's vehicle registration fee revenue is now committed for several decades to paying debt service on transportation revenue bonds issued since 2003 to cover funding shortfalls. General obligation bonds, with general fund debt service, were also issued to make up for recent diversion of transportation fund revenue to the state's general fund. To rebuild the rural Interstate and southeastern freeway system in a timely manner will require an additional source of transportation revenue.

This study explores the feasibility of using toll revenue financing to pay for this $26.2 billion reconstruction and modernization program. Under the principle of value-added tolling, tolls would not be charged on a corridor until it was reconstructed and modernized. All toll revenues would be dedicated to the rural Interstate and southeastern freeway system corridors, as pure user fees. Based on a 30-year program of reconstruction and assuming moderate toll rates comparable to those on other toll road systems, the study estimates that the entire rural Interstate program could be financed by toll revenue bonds. For the southeastern freeway system, one option is to toll only the new lanes, operating them as express toll lanes. Doing so would produce enough revenue to cover about 17% of the cost of the entire freeway system reconstruction. Tolling would be all electronic, with no toll booths or toll plazas to impede traffic. If political support could be garnered to price all lanes on the southeastern freeway system instead, our analysis estimates that the revenues would cover 71% of the cost of reconstruction.

Three federal pilot programs are available to launch major elements of this program, but the remainder of the program would require a broadening of those pilot programs, which is possible during the 2011 reauthorization of the federal surface transportation program.

Introduction

Wisconsin's Aging Interstates

The Interstate highways in Wisconsin are the mainstay of the state's transportation system. Despite representing less than 1% of the centerline miles of the state's roadways, they carry 18% of vehicle miles of travel and 21% of all heavy truck miles of travel in the state. The urban freeways in southeastern Wisconsin, despite peak-period congestion, handle about 33% of all commuting in the region. Projections from WisDOT show that even with all currently planned improvements in urban transit and railroads, the Interstates and freeways will continue to handle comparable shares of traffic over the next 25 years.

It is important to remember that the Interstate system was laid out in the 1940s, and although two routes were later added in Wisconsin (I-43 and I-39), the national Interstate map is still largely what was planned for a very different America than exists today, more than 60 years later. Wisconsin's population in 1940 was 3.13 million, compared with 5.69 million in 2010, and while Wisconsin is not a fast-growing state today, its population is projected to increase to 6.53 million by 2030, with its economy growing proportionally. The healthier Wisconsin's economy, the more business and leisure travel will grow, especially trucking. Consequently, the state's most important travel arteries must be modernized to keep pace.

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Highways don't last forever, even with proper ongoing maintenance. Highway engineers consider the typical useful life of a highway to be 50 to 60 years, at which point it generally needs complete reconstruction. Such reconstructions also provide an opportunity to rebuild the highway to current safety and performance standards, as illustrated by the recent redesign and reconstruction of the Marquette Interchange in Milwaukee. Many portions of both rural and urban Interstates in Wisconsin were first opened to traffic in the late 1950s and early 1960s and will be reaching their 60-year anniversaries within the next decade. As we saw with the Marquette reconstruction, the cost of redesigning and rebuilding the Interstates in Wisconsin will likely require tens of billions of dollars, going far beyond the typical annual capital budgets of WisDOT.

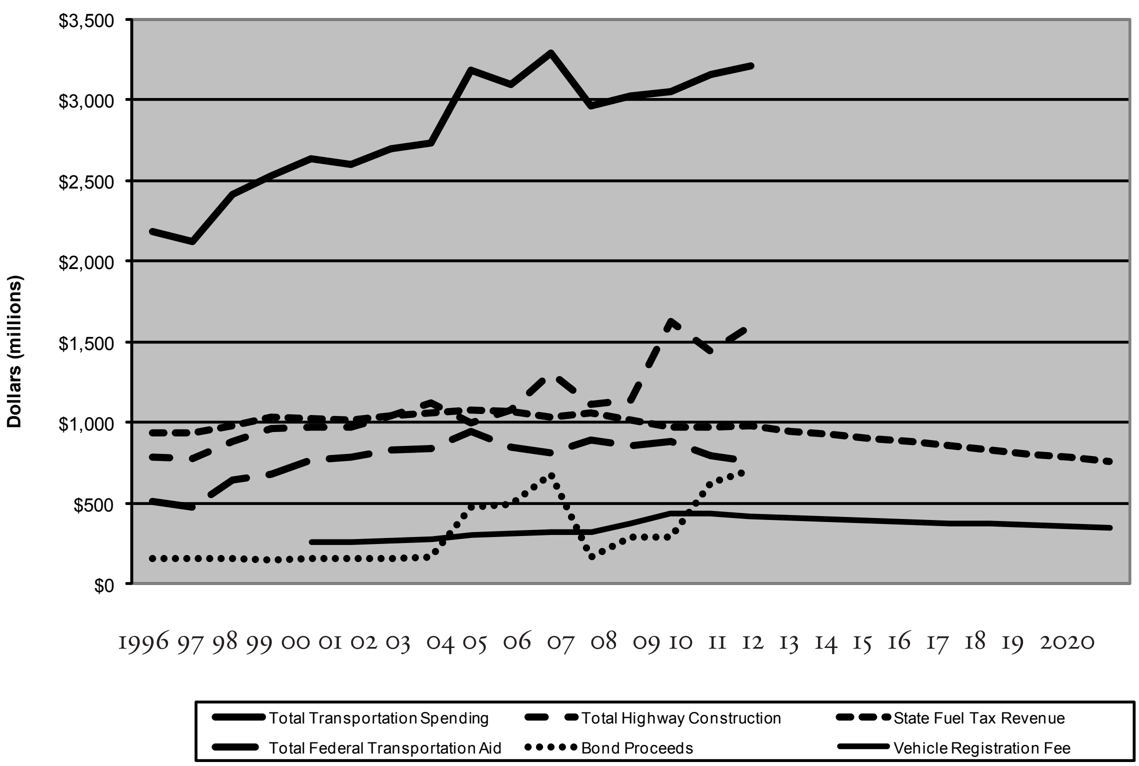
Wisconsin's Budget Situation

Like many other states, Wisconsin faces near-term budget shortfalls, including a projected $3.3 billion shortfall in its general fund. During the past eight years, $1.3 billion was diverted from the transportation fund to pay for schools and other general-fund programs. To prevent large cuts in transportation spending, the state issued $865 million in general obligation bonds, backed by the general fund, as well as transportation revenue bonds, backed by vehicle registration fees. That means a portion of future registration fee money must be used for several decades to pay off the interest and principal on those bonds, rather than being spent on highway maintenance or construction.

In early December 2010, outgoing Transportation Secretary Frank Busalacchi proposed a $300 million reduction in transportation spending for the next biennial budget, due to lower transportation revenues. "For Wisconsin, traditional revenue sources of transportation are not providing the natural growth they once did," Busalacchi told the *Milwaukee Journal Sentinel*.[1] Indeed,

Figure 1 shows the Wisconsin DOT's projections of state fuel tax and vehicle registration fee revenue through 2020. The historical data in this figure show how proceeds from bond issues have played a key role in offsetting the reduced growth in state fuel tax and registration fee revenue. Note also that federal transportation money peaked, in real terms, in 2004, and has been trending downward since then. With no increase in federal fuel taxes anticipated, and stimulus funding nearing its end, the prospects for increased federal transportation funding are low. These trends suggest that it will be very difficult to pay for Interstate reconstruction and modernization over the next two decades out of traditional funding sources.

Figure 1
Wisconsin Transportation Funding Trends (Constant 2009 Dollars)



Source: historical data from Table 2, Transportation Budget Trends, 2010, Office of Policy, Budget and Finance, Wisconsin DOT, November 2010; projections provided to the author by that office, Dec. 17, 2010.

The Declining Value of Highway User Taxes

Highways in Wisconsin, like those in most states, are funded primarily via state and federal fuel taxes. The federal fuel taxes on gasoline and diesel fuel have not been increased since 1993, and Wisconsin's state fuel tax rates have remained the same since 2006. The state fuel taxes were indexed to inflation from 1985 to 2005, but the legislature then repealed that provision.

The decline in the real value of fuel tax revenues is a problem faced by all states, not just Wisconsin. This decline has occurred for two reasons. First, the fuel tax is levied on each gallon of fuel consumed, not on the number of miles driven. Therefore, as fuel economy (miles driven per gallon consumed) has essentially doubled since the 1970s, fuel tax receipts per mile driven have been cut in half. Second, due to popular opposition to tax increases in general, it has been difficult for both state and federal elected officials to increase highway fuel tax rates. In addition, in recent years highway construction cost inflation has been significantly greater than general consumer-price inflation, further straining transportation budgets.

Another aspect of this dilemma looms before us. Federal policy is increasingly committed to reducing both oil consumption and emissions of greenhouse gases (GHGs). Transportation (cars, trucks, aircraft, ships, railroads, etc.) accounts for about 27% of U.S. oil use and GHG emissions. Federal actions in coming years point to further increases in mandatory fuel-economy standards for new vehicles, both cars and trucks. In addition, there are likely to be continued and possibly increased subsidies and incentives for the purchase of alternative-fuel vehicles (such as hybrids, electric cars, etc.). These policies will further reduce the amount of gasoline and diesel tax revenues per mile driven, thereby making highway finance even more difficult than it already is (unless federal and state fuel tax rates are increased enough to compensate).

Congress appointed the National Surface Transportation Infrastructure Financing Commission to study this problem and recommend a way forward.[2] In its 2009 final report, the commission concluded that the current fuel-tax funding system is not sustainable and should be replaced by a "mileage-based fee system," to be implemented beginning in 2020. It urged the federal government to take the lead, developing a federal mileage-charge system that would replace the federal gasoline and diesel taxes as the principal revenue source for the federal Highway Trust Fund. States would be encouraged to piggy-back on this system to replace their own highway user taxes with state mileage charges.

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Because it recognized that a transition to vehicle mileage charges would involve many technical and policy questions and could likely take decades to phase in even after those questions are settled, the commission also recommended that Congress grant states more flexibility to use tolling to supplement current highway fuel tax revenues, including a number of specific policy changes that could be included in the pending (2011) reauthorization of the federal surface transportation program.

The Changing Face of Tolling

The U.S. Interstate system actually began as a series of toll roads in the Northeast and Midwest just after World War II. The Pennsylvania Turnpike (which was built before World War II), the Massachusetts Turnpike, the Connecticut Turnpike (which was de-tolled in 1988), the New York State Thruway, the Ohio Turnpike, and the Indiana Toll Road were among the major routes incorporated into the Interstate system when Congress created it in 1956. In part because they had toll revenue bonds outstanding, Congress "grandfathered" them into the Interstate system, but decreed that all new Interstate corridors must be non-tolled. States were permitted to build connecting expressways with toll funding (as in Illinois), and several Interstate routes in Kansas and Oklahoma that had begun with toll financing were also allowed to continue that way. But the general anti-toll provision from the 1956 legislation remained largely unchanged until the ISTEA reauthorization of 1991. That law began a gradual liberalization of federal tolling policy that continued with the TEA-21(1998) and SAFETEA(2005) laws.

In the last 15 years, according to a Federal Highway Administration (FHWA) study, toll finance has been used to construct between one-third and one-half of all new limited-access highway capacity in this country.[3] The same study projected that, due to reduced availability of fuel-tax monies for new construction, toll finance would play an even larger role in coming decades.

To most people in states without toll roads, "tolling" brings to mind images of multilane toll plazas with hundreds of vehicles lined up, waiting to throw coins into a hopper or hand cash to a toll booth attendant. That picture accurately describes most 20th-century tolling. However, the last 15 to 20 years have seen a revolution in toll technology. Electronic toll collection, using a windshield-mounted transponder, was introduced as a way to reduce the time it takes to get through conventional toll plaza lanes. It next evolved, as in Illinois, to "open road tolling" (ORT), in which transponder-equipped vehicles completely bypass toll plazas and pay simply by passing beneath an overhead gantry. Those without transponders pay at toll booths off to one side. ORT has increasingly become standard on major toll roads, including those of the Illinois Tollway and Florida's Turnpike, as well as many important urban toll roads.

The third stage of electronic tolling does away with cash collection on the toll road altogether. Those without transponders are billed based on a video recording of their license plate numbers. People desiring to pay in cash can be allowed to do so by setting up an account that they replenish with cash at kiosks, typically at gas stations and convenience stores. Fully cashless (on-road) tolling is in operation on toll roads in Dallas, Denver, the Maryland suburbs of Washington, Miami, Puerto Rico, and Toronto; other toll roads are in various stages of planning for cashless tolling.

For purposes of this study, we assume full-scale, cashless 21st century tolling. There would be no toll booths and no toll plazas. Electronic toll collection would use technology compatible with the Illinois I-Pass system, which is interoperable with all toll systems in the Northeast and Midwest under the multistate E-ZPass system.

The Role and Value of Wisconsin's Interstates

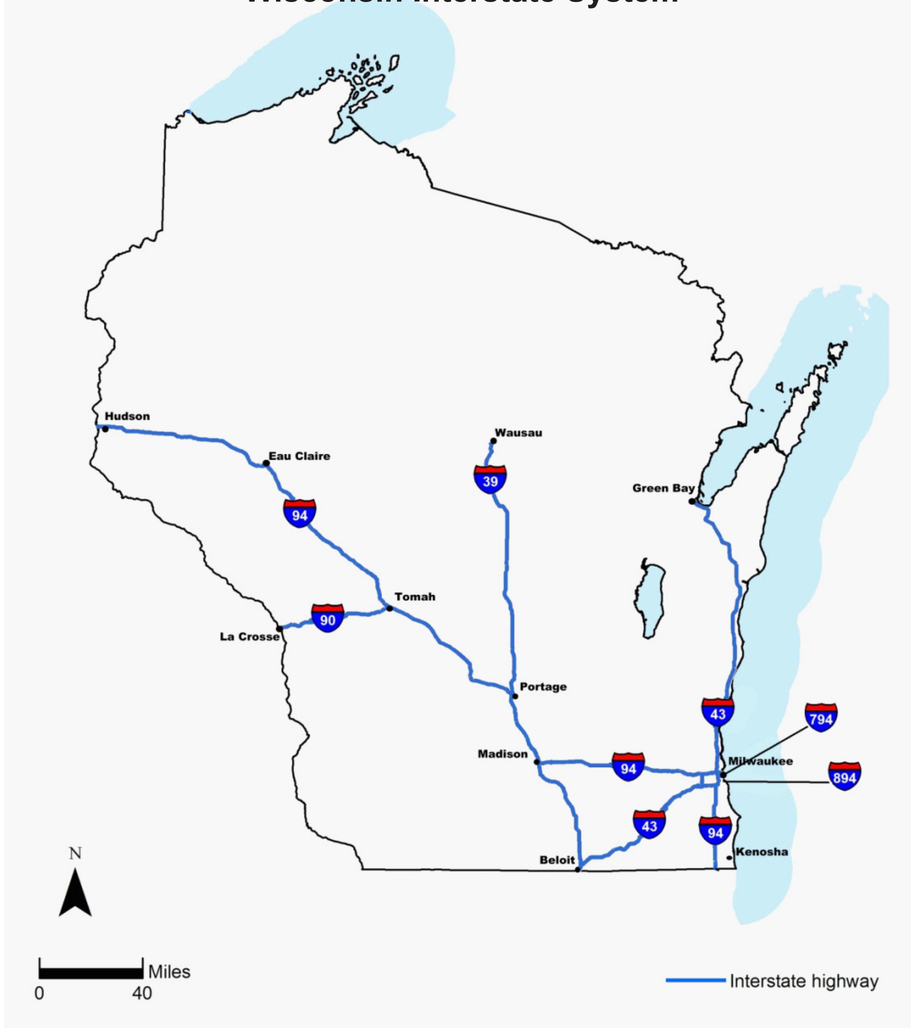
The Interstate system constitutes the principal set of arteries for both personal and goods-movement transportation in Wisconsin, as in most states. While accounting for only 0.65% of total highway centerline miles, the Interstates handle 18% of all vehicle miles of travel. They also account for 21% of all heavy truck miles traveled.[4]

The construction of Wisconsin's Interstate system was paid for by highway users in the form of federal and state highway user taxes, primarily on gasoline and diesel fuel. A 2004 study by the US Department of Transportation's Bureau of Transportation Statistics found that the federal highway program is entirely self-supporting (i.e., the federal government collects in highway user taxes slightly more than it spends on all federal highway programs).[5]

The Interstate system today is maintained via a combination of federal and state highway user-tax revenue, administered by WisDOT, which owns and operates the system in accordance with regulations promulgated by the FHWA.

Figure 2 shows the current Wisconsin Interstate system. The earliest segments were built in the late 1950s and opened to traffic in 1959. Many other corridors were completed and opened during the 1960s, including most of what is now called the Southeastern Wisconsin Freeway System. The northern part of the I-43 corridor, from Milwaukee to Green Bay, opened in 1981 and the southern portion in 1987. The most recent addition was I-39 from Portage to Wausau, which opened in 1992.

Figure 2
Wisconsin Interstate System



Neither I-43 nor I-39 was part of the original Interstate system map, drawn up in the 1940s; these segments were added later, due to changes in the locations and amounts of economic activity. At present, one major highway — US 41 — is planned for upgrading to Interstate configuration between Milwaukee and Green Bay. Over the next 40 years, it is quite possible that other corridors could reach a level of freight and passenger traffic that would warrant consideration for upgrading, as well.

Besides possible additions of routes to the Interstate system, continued population and economic growth make it likely that some corridors will require widening in coming decades. In October 2010 the state's Transportation Projects Commission voted to proceed with one such project, widening I-90/39 between Madison and the Illinois border from four lanes to six. WisDOT currently supports widening when a highway corridor's volume is such that congestion becomes a problem — as indicated by what traffic engineers define as the "level of service" declining from D to E or F, indicating frequent congestion. (Under the previous "State Highway Plan — 2000," WisDOT's goal had been to maintain level of service C conditions on rural Interstates.)

WisDOT devotes considerable resources to ongoing maintenance of its highways. According to the *19th Annual Highway Report*,[6] which provides comparative data on the highway systems of all 50 states, as of 2008 (the most recent data available on a national basis), 3.35% of Wisconsin's rural Interstate mileage was ranked as being in poor condition. That sounds pretty good, but the 50-state average was 1.93%, and Wisconsin's score put it in 44th place nationally. Twenty-two states had zero Interstate miles in poor condition. Wisconsin scored much better on other rural highways, with only 0.35% of miles in poor condition, better than the 50-state average of 0.53% and ranking it 23rd among states. Wisconsin scored rather poorly on urban Interstate conditions, with 7.55% of miles in poor shape, against a national average of 5.37%, ranking it in 41st place on that measure. Wisconsin did far better on deficient bridges, ranking in sixth place nationally, with only 14.3% of bridges either functionally obsolete or structurally deficient; the national average was 23.72%.

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While routine preventive maintenance extends the lives of pavement and bridges, they do not last forever. Highway engineers consider the useful life of a well-maintained highway to be 50 to 60 years. Over the next several decades, a number of Wisconsin's Interstates will reach 50 years, and some will reach 60 years. When a highway reaches that point, it generally needs to be completely reconstructed, down to the subpavement beneath the concrete or asphalt paving. Such a reconstruction is also an opportunity to upgrade a highway's physical design characteristics to current standards, many of which have evolved over time to enhance safety or vehicle performance. If interchanges need to be redesigned or lanes added in the foreseeable future, making those changes at the same time as reconstruction will minimize disruptions faced by highway users due to construction projects. However, making all those changes at once may convert a medium-size project to a mega-project (i.e., billion-dollar scale), which poses a funding challenge.

The Southeastern Wisconsin Freeway System is considered separately from the rural Interstates, for both planning and funding purposes. This system suffers from growing congestion, aging infrastructure, some degree of obsolete design (such as left-lane exits at freeway interchanges, a design no longer considered acceptable for safety and traffic flow reasons), and potential funding shortfalls. The *19th Annual Highway Report* ranked Wisconsin 27th in the percentage of a state's urban Interstates experiencing congestion (44.23%). The most recent *Urban Mobility Report* from the Texas Transportation Institute put the Milwaukee urbanized area's travel time index at 1.13 (which means it takes 13% longer to make a trip during peak periods than during other times of day).[7] While moderate compared with congestion in larger urban areas such as Chicago or Minneapolis-St. Paul, Milwaukee's congestion results in an average of 18 delay-hours per traveler per year, adding up to 14.9 million vehicle hours of delay, and a cost (in wasted time and fuel) of $307 million per year.

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The Southeastern Wisconsin Regional Planning Commission (SEWRPC) has produced a 30-year plan for reconstructing and modernizing the southeastern freeway system, beginning with the replacement of the Marquette Interchange and continuing through 2035. The plan includes reconstruction of the Hale, Stadium, and Zoo interchanges, in addition to widening many of the principal freeways with an additional lane in each direction. WisDOT's *Connections 2030* notes that "without the additional capacity, the regional planning commission forecasts 47 percent of the freeway will experience moderate to severe congestion by 2035, almost double the level of congestion in 2001."[8] The reconstruction and widening of I-94 south of the Mitchell Interchange is under way as of 2010. The most recent cost estimate for this overall project (excluding the already completed Marquette project) is $7.8 billion in 2009 dollars, which SEWRPC equates to $11.7 billion in year-of-expenditure dollars.[9]

The Cost of Rebuilding and Modernizing

Rural Interstates

Our model for introducing tolling on these corridors is "value-added tolling." In other words, tolling a particular corridor, from point A to point B, will be introduced only when that corridor has been reconstructed and modernized. Users will not be asked to pay a toll to continue using existing Interstates until there are major improvements. But short of Congress or the legislature enacting a very large increase in fuel taxes, timely reconstruction and modernization of these Interstates is likely to happen only if a new source of funding is agreed upon; existing fuel-tax revenues are far from adequate for the modernization program set forth in this report.

Our first step in assessing the costs of reconstructing and modernizing the rural Interstates was to define a series of "projects" over the next 30 years. To do this, we obtained two kinds of information from WisDOT for each Interstate corridor. First, we asked the agency to calculate the average age of each corridor, in order to figure out when each would reach its 60th anniversary, warranting reconstruction. Second, we asked for WisDOT's projection of the level of service (LOS) — a standard traffic engineering measure of the degree of congestion. LOS is expressed by a letter grade, ranging from A (completely free-flowing) to F (serious congestion). For rural Interstates, when the majority of the corridor is at E or F, then WisDOT considers lane additions warranted. (Some would argue that once a corridor is projected to be at LOS D, widening should be done, but for this study, we followed current WisDOT practices.)

Table 1
Rural Interstate Reconstruction Plan

Rural Corridor #	Route	From	To	Construction years	Average age	Age 60	LOS 2030	LOS 2040	Reconstruction year	Lane add	Basis
1	I-39/I-90	IL	Madison	1962-'98	21.3	2049	F	F	2015	yes	congestion
2	I-39/90/I-94	Madison	Portage	1984-'99	21.4	2049	E-	F-	2015	yes	congestion
3	I-39	Portage	Wausau	1959-'07	24.9	2045	B-	B-	2040		age
4	US 41	Allenton	Green Bay	1955-'00	31.5	2039	D-	D	2020		age
5	I-43	Beloit	Darien	1969-'79	36.4	2034	A-	A-	2029		age
6	I-43	Cedar Grove	Green Bay	1967-'81	32.1	2038	C+	C	2033		age
7	I-90	MN	Tomah	1959-'02	32.6	2037	C+	C+	2032		age
8	I-90	Tomah	Portage	1985-'97	18.1	2052	D-	E+	2025	yes	congestion
9	I-94	MN	Tomah	1959-'96	29.6	2040	C-	D+	2035		age
10	I-94	Madison	Oconomowoc	1965-'02	50.0	2020	C	C	2015		age

Table 1 summarizes the results of this exercise, showing all the rural Interstate corridors as defined by WisDOT, the year each reaches an average age of 60, and our summary of WisDOT's estimates of LOS for the smaller segments that make up each corridor. The table also indicates the year in which our proposed reconstruction would begin, and whether or not the project would include lane additions (based on the extent of projected congestion).

The next step is to estimate the cost of these projects. This is done first in 2010 dollars. The data source for this "generic" analysis is the FHWA's Highway Economic Requirements System (HERS) database on highway construction costs. Table 2 shows selected numbers from HERS, which are national averages as of 2006. In the second column, these are adjusted for highway cost inflation between 2006 and 2010, using a highway construction cost index maintained by the American Road & Transportation Builders Association. Due to the large increase in highway construction costs during this period, 2010 costs are 1.415 times 2006 costs, based on ARTBA's cost index.

The third step is to estimate the cost of each project from Table 1, in 2010 dollars, based on the number of lane-miles being reconstructed, the number of new lane-miles added (if any), and the appropriate unit cost from Table 2. WisDOT advised using the "rolling terrain" cost numbers for rural Interstates, and in the case of lane additions using the "high" cost estimates. These results are shown in Table 3. Construction costs for the build year have been escalated from 2010 costs using the average annual construction cost inflation from the ARTBA data over the past 16 years: 4.1% per year. (This is considerably more than the average annual consumer price index over this same period: 2.39%.) Adding up the build-year costs, we can see that the total cost of these rural Interstate reconstruction projects is $12.5 billion. Table 3 also calculates the net present value (NPV) of these projects as of 2010, using a typical discount rate for such purposes of 6%. The NPV of the set of projects is $4.8 billion. We will use this number later on in this report in assessing the economic and financial feasibility of funding this modernization from toll revenues.

Table 2
FHWA Rural Interstate Unit Costs of Construction

	2006 millions of dollars per lane-mile*	2010 millions of dollars per lane-mile**
Reconstruct, flat terrain	$1.170	$1.656
Reconstruct, rolling terrain	$1.200	$1.698
Reconstruct and widen, flat	$1.791	$2.534
Reconstruct and widen, rolling	$2.007	$2.840
Add lanes, flat terrain	$2.301	$3.256
Add lanes, rolling terrain	$2.495	$3.530
Add lanes, flat, high-cost	$3.191	$4.515
Add lanes, rolling, high-cost	$4.037	$5.712

*FHWA HERS database, 2006
**Based on ARTBA construction cost index adjusted to 2010

Table 3
Rural Interstate Reconstruction Project costs

Rural Corrlidor #	Route	From	To	Lanes	Route-miles	Lane-miles	Project	Start Year	2010 unit cost (million)	Build year unit cost (million)	Build year cost (million)	NPV factor	NPV cost (million)
1	I-39/ I-90	IL	Madison	4	45.54	182.16	add 2 lanes	2015	$3.53	$4.32	$393	0.7473	$294
2	I-39/ I-90/I-94	Madison	Portage	6	33.09	198.54	add 2 lanes	2015	$3.53	$4.32	$286	0.7473	$213
3	I-39	Portage	Wausau	4	103.51	414.04	reconstruction	2040	$1.70	$5.67	$2,347	0.1741	$409
4	US 41	Allenton	Green Bay	4	227.02	933.5	reconstruction	2020	$1.70	$2.54	$2,369	0.5584	$1,323
5	I-43	Beloit	Darien	4	14.99	59.96	reconstruction	2029	$1.70	$3.64	$218	0.3305	$72
6	I-43	Cedar Grove	Green Bay	4	78.94	315.76	reconstruction	2033	$1.70	$4.28	$1,351	0.2618	$354
7	I-90	MN	Tomah	4	45.1	183.02	reconstruction	2032	$1.70	$4.11	$752	0.2775	$209
8	I-90	Tomah	Portage	4	63.49	253.96	add 2 lanes	2025	$3.53	$6.45	$819	0.4173	$342
9	I-94	MN	Tomah	4	146.9	595.88	reconstruction	2035	$1.70	$4.64	$2,763	0.233	$644
10	I-94	Madison	Oconomowoc	4	146.9	595.88	reconstruction	2015	$1.70	$2.08	$1,237	0.7473	$924
Total											**$12,536**		**$4,783**

Southeastern Wisconsin Freeway System

The SEWRPC 30-year reconstruction plan calls for rebuilding the four major urban interchanges (Marquette, Hale, Zoo, and Stadium) and widening much of the southeastern freeway system by one lane in each direction. In 2009 dollars, the plan is estimated to cost $7.8 billion, which SEWRPC estimates will equate to $11.7 billion in build-year dollars.

A major portion of reconstruction of the Marquette Interchange was completed several years ago, though an estimated $537 million of additional work remains to be done in future years. The SEWRPC plan provides a schedule of reconstruction projects, in five phases, beginning with the project currently underway to rebuild I-94 from the Illinois border to somewhat north of the Mitchell Interchange (2010-2015). The second phase would reconstruct the I-894's western and southern legs, along with the Zoo and Hale Interchanges (2016 to 2020). Phase 3 would rebuild US 45 and outlying portions of I-43 and I-94 (2021 to 2025). The heavily congested I-94 through downtown and the close-in western suburbs, along with the Stadium Interchange, would not be rebuilt until Phase 4 (2026 to 2030), and the additional work on the Marquette would wait until Phase 5 (2031 to 2035).

While this report cannot go into engineering detail, we have revisited the phasing of these improvements in light of the study's premise of using toll revenues both to finance reconstruction and to provide congestion relief by means of pricing. Both of those purposes place a premium on rebuilding and tolling the most congested portions of the systems as soon as possible. Ideally, that would mean rebuilding all the inner freeways (which are generally the most congested) as Phase 2. However, as a practical matter, having the entire core of the southeastern freeway system under construction at once would pose too great a disruption of travel during the assumed five-year construction period. Hence, our phasing plan takes that into account.

Our Phase 2 would reconstruct the Zoo interchange, US 45, and the western portion of I-894, as well as I-43 heading north from the Marquette interchange. Phase 3 would rebuild I-94 east-west and the Stadium interchange, as well as Hale interchange and I-43 from the Hale to the Mitchell to the Marquette. Phase 4 would rebuild I-794 to the extent necessary, and Phase 5 would rebuild I-43 south of the Hale interchange. Table 4 summarizes the projects involved, indicating which ones are to be rebuilt triggered by their age and which ones need reconstruction earlier than that due to lack of lane capacity.

Table 4
Urban Freeway Reconstruction Plan

Urban Corridor #	Route	From	To	Construction years	Average age	Age 60	LOS 2010	LOS 2030	LOS 2040	Reconstruction year	Lane add	Basis
11	US 41	Milwaukee	Allenton	1953-55	56	2014	C	C-	D+	2020		age
12	I-43	Darien	Milwaukee	1987	23	2047	B	B-	B-	2030		age
13	I-43	I-894	I-94/794	1965-03	26	2044	D-	E-	E-	2020	yes	congestion
14	I-43	I-94/794	Cedar Grove	1956-68	48	2022	D-	E-	E-	2015	yes	age
15	US 45	I-94	US 41	1963-67	45	2025	F	F	F	2015	yes	congestion
16	I-94	Oconomowoc	I-43/794	1962	48	2022	E	F+	F	2020	yes	congestion
17	I-94	IL line	I-43	1959	51	2019	C-	E-	E-	2010	yes	congestion
18	I-794			1977	33	2037	C+	C-	C-	2025		age
19	I-894	I-43	I-94	1963	47	2023	E-	F+	F	2015	yes	congestion

As we did with the rural Interstate corridors, we next estimate the unit costs in 2010 dollars, using the applicable 2006 HERS data for urban freeways, updated using the ARTBA construction cost index to 2010 values. Those costs are shown in Table 5.

As noted by the asterisks to Table 5, two of these unit costs do not come directly from HERS. For the east-west portion of I-94, the portion west of I-894 is estimated to have the same unit cost as the standard HERS "reconstruct and widen" figure for large urban areas. But since costs will likely be much higher for the 6 miles between the Zoo and Marquette Interchanges, we assume double that unit cost for that portion. Table 5 then shows the weighted average unit cost, to be applied to all 33 route-miles of this I-94 corridor. Second, for reconstruction of the elevated I-794, we have doubled the HERS unit cost figure for "reconstruct only," which HERS assumes to be mostly at-grade.

Putting these costs together with data from Table 4 on the freeway corridors gives us the costs shown in Table 6. As was done with the rural corridors in Table 3, we escalate the 2010 unit costs by 4.1% per year to the build year shown and then calculate the total build-year cost by multiplying the lane-miles by the unit cost. The only exception to this is the Zoo Interchange, for which we use the SEWRPC build-year cost number. As the table shows, the build-year cost of the freeway reconstruction projects totals $13.7 billion, somewhat higher than SEWRPC's estimate of $11.7 billion. The NPV of these costs, as of 2010, is $8.7 billion.

Table 5
FHWA Urban Freeway Unit Construction Costs

	2006 millions of dollars per lane-mile	2010 millions of dollars per lane-mile
Reconstruct only, large urban	$3.340	$4.726
Reconstruct and widen, large urban	$5.008	$7.086
Reconstruct and widen, I-94 E-W*	$5.907	$8.358
Reconstruct elevated, large urban**	$6.680	$9.452

*weighted average of twice the HERS "reconstruct and widen" cost east of Zoo interchange and HERS "reconstruct and widen" cost west of Zoo interchange

**estimated as double the cost of "reconstruct only"

Table 6
Urban Freeway Reconstruction Project Costs

Urban Corridor #	Route	From	To	Route-miles	Lane-miles	"After" Lane-miles	Project	Start Year	2010 unit cost (million)	Build year unit cost (million)	Build year cost (million)	NPV factor	NPV cost (million)
11	US41	Milwaukee	Allenton	34.17	160.9	160.9	reconstruct	2020	$4.726	$7.064	$1,137	0.5584	$635
12	I-43	Darien	Milwaukee	45.49	181.64	181.64	reconstruct	2030	$4.726	$10.557	$1,918	0.3118	$598
13	I-43	I-894	I-94/794	11.44	70.84	93.72	reconstruct+ widen	2020	$7.086	$10.590	$992	0.5584	$554
14	I-43	I-94/794	Cedar Grove	40.17	175.72	256.06	reconstruct+ widen	2015	$7.086	$8.663	$2,218	0.7473	$1,658
15	US 45	I-94	US 41	8.44	48.9	65.78	reconstruct+widen	2015	$7.086	$8.663	$570	0.7473	$426
16	I-94	Oconomowoc	I-43/794	33.04	169.56	235.64	reconstruct+widen	2020	$8.358	$12.491	$2,943	0.5584	$1,644
17	I-94	IL line	I-43	30.16	180.96	241.28	reconstruct+widen	2010	$7.086	$7.086	$1,710	1	$1,710
18	I-794			3.4	17.5	17.5	reconstruct	2025	$9.452	$17.269	$302	0.4173	$126
19A	I-894	Zoo Interchange	Zoo Interchange				reconstruct	2015			$1,560	0.7473	$1,166
19	I-894	I-43	I-94	4.85	26.18	35.88	reconstruct+widen	2015	$7.086	$8.663	$311	0.7473	$232

Total (in millions) **$13,661** **$8,749**

The Changed Federal Context on Tolling

Tolling since ISTEA

As noted in Part 1, beginning with the ISTEA reauthorization legislation in 1991, Congress has been liberalizing what had been a virtually complete ban on tolling on the federal-aid highway system. (The subsequent TEA-21 and SAFETEA reauthorizations continued the process begun with ISTEA.)

As of 2011, states may use toll financing as follows:

•On any federal-aid highway except Interstates;

•To reconstruct bridges and tunnels on the Interstates;

•To convert existing high-occupancy vehicle (HOV) lanes to high-occupancy toll (HOT) lanes;

•To price existing urban Interstate lanes to reduce congestion;

•To add express toll lanes to Interstates for congestion relief;

•To reconstruct Interstates if other funding is insufficient (three-state pilot program);

•To construct new Interstates (another three-state pilot program).

Three federal programs are of particular relevance for this study, since they provide the basic legal framework on which rests our assessment of toll financing for reconstructing and modernizing Wisconsin's Interstate highways.

Interstate System Reconstruction and Rehabilitation Pilot Program

This pilot program, dating to TEA-21, allows up to three existing Interstate facilities to be tolled in order to fund needed reconstruction or rehabilitation that could not otherwise be funded. As of 2010, because slots have been reserved for Virginia and Missouri, there is only one slot open in this pilot program.[10] Toll revenues from the reconstructed Interstate must be used only for debt service, a reasonable return on investment of any private entity financing the project, and any costs necessary for future improvements (beyond the initial reconstruction) and maintenance of the tolled corridor, including any subsequent reconstruction, resurfacing, restoration, and rehabilitation.[11] In other words, the specific Interstate corridor allowed to be reconstructed via toll financing thereby obtains a permanent, dedicated revenue stream to ensure its long-term viability.

Interstate System Construction Toll Pilot Program

This pilot program, from SAFETEA, authorizes up to three new Interstate highways to be financed based on projected toll revenues. The use of toll revenues is subject to the same conditions as noted above for the Interstate Reconstruction pilot program — that is, they must be used for that specific corridor, including ongoing maintenance and operation and subsequent modernization and reconstruction. As of 2010, two of the three slots in this pilot program are available; one slot has been reserved for South Carolina.

For both of these pilot programs, a complete system of Interstate highways within a state is not eligible. Each pilot program applies only to a specific Interstate corridor in a state (for example, the full length of I-94 within Wisconsin or the planned upgrade of U.S. 41 to Interstate status).

Value Pricing Pilot Program

This pilot program dates back to ISTEA in 1991. Its focus is on pricing to relieve congestion in urban areas. In addition to providing permission for such projects, this program provides modest grants for planning and evaluation of such projects. Under VPPP, a state could legally price all lanes of an urban Interstate system to manage congestion.[12] As a pilot program, VPPP is authorized to work with up to 15 "project partner" states. Wisconsin is not currently a project partner, and all 15 such slots are nominally occupied. However, some states have done only one project since 1991 and are not currently active in the program. The *Federal Register* notice announcing 2011 funding and proposal solicitation encouraged proposals from states not among the current 15 project partners.[13]

2011 Reauthorization Prospects

The current authorization for the federal program, SAFETEA, expired Sept. 30, 2009. Since then, Congress has extended its provisions several times. With the change in control of the House, the Transportation and Infrastructure

Committee scrapped the previous draft bill (which called for a near doubling of the size of the program but without coming up with a funding source) in favor of a back-to-basics bill that includes no increase in federal fuel taxes and refocusing the legislation on core programs.

To compensate for not giving the states more federal funding, many observers expect the bill to further ease federal restrictions on tolling and pricing, to permit states to better leverage existing resources.[14] Though removal of all restrictions on Interstate tolling is not expected (and likely would be fought bitterly by highway user groups), an expansion of the two pilot programs specifically focused on tolling, the Interstate System Reconstruction and Rehabilitation Pilot program and the Interstate Construction Toll Pilot Program, is a good possibility. It should be noted that in the congressional debates over these two pilot programs, first during TEA-21 and again during SAFETEA, highway user groups were directly involved in recommending the provisions dealing with the use of toll revenues, and ended up supporting (or at least not opposing) both of those pilot programs.

This study's analyses were completed at the end of 2010, well before the new Congress convened and began work on the reauthorization measure. In order to model Interstate tolling in a plausibly realistic way, we assumed the following:

•Congress liberalizes both Interstate toll pilot programs to expand the number of projects allowed within a state (instead of allowing only one per state);

•Congress retains the current limitations on the use of toll revenues (i.e., only for construction, reconstruction, and ongoing operation and maintenance of the tolled roads);

•Congress retains the Value Pricing Pilot Program in its current form and permits states that are not current project partners to take part.

These provisions are only modest extrapolations of current federal law. They have the added advantage that the strictures on the use of toll revenue have been vetted and accepted by highway user groups. The application of tolling to Wisconsin's rural and urban Interstates, based on those assumed provisions, will be discussed in the following two sections.

As this report was being finalized, a non-final draft of the Obama administration's reauthorization proposal was circulated among transportation organizations. Section 2217 of that draft concerns tolling, and it offers two new provisions to replace the existing pilot programs. The first would permit variable pricing on all lanes of urban freeway systems in metro areas larger than one million people. As noted previously, this is already permitted for metro areas in states that are "project partners" under the Value Pricing Program (which Wisconsin is not). The second new provision would permit states to construct new Interstates using toll finance, and to "toll existing Interstate facilities for the purpose of constructing one or more new lanes." This would appear to be a narrower opportunity than provided under the current Interstate Reconstruction Toll Pilot Program, but it would apply to all states without numerical limitation. Whether these provisions will remain in the administration's final legislative proposal, and whether they will gain traction with Congress, remains to be seen.

The Value-Added Tolling Principle

Our proposed model is what we call "value-added tolling." That means tolling of a particular rural Interstate corridor would be implemented only when major value is added for the users of that corridor. In this study we envision three possible forms of value-added:

1. Reconstructing an aging Interstate corridor to replace worn-out pavement and bring its 40- to 60-year-old design up to modern safety and performance standards;

2. Widening a corridor that is becoming congested in order to alleviate congestion and accommodate projected growth, especially in truck traffic;

3. Upgrading an existing federal or state highway to full Interstate standards.

Another aspect of value-added tolling is the use of the resulting toll revenues. In accordance with the conditions established by Congress in the two Interstate tolling pilot programs summarized on page 16, toll revenues from the tolled Interstates would be used only for the construction, operating, and maintenance costs of the Interstates. There is no intent to convert Interstate toll revenues into a general funding source, either for transportation projects elsewhere in the state or, even worse, as a new source of state general fund revenue. In effect, value-added tolling as proposed here is a pure user fee, analogous to the usage-based charge households pay for water or electricity. By contrast, were toll revenues to be used for unrelated transportation or general government purposes, tolling would be a new form of tax.

Toll Revenue Bond Funding

The reconstruction and modernization proposed in this report would be financed up front via the issuance of long-term toll revenue bonds. This is how nearly all toll roads in the United States are paid for. While Wisconsin in recent years has used a form of revenue bonding to make up for shortfalls in its transportation fund, the money used to pay the interest and principal on those bonds is annual vehicle registration fee revenue. Thus, while making it possible to do highway construction projects sooner than would otherwise be possible (by financing them, rather than paying cash), that bonding program does not add to the size or scope of the highway program. Our proposed toll revenue bonding, by contrast, would expand the amount of highway investment, because the principal and interest on the toll revenue bonds would be paid for by a net new funding source (toll revenues), supplementing the inadequate current transportation revenues.

Projecting Corridor Traffic

This preliminary study is intended only to develop "sketch-level" estimates of what an Interstate tolling program might be able to do. A more detailed assessment would require a sophisticated traffic and revenue study by a transportation planning firm to assess feasibility at a greater level of detail and to determine optimal toll rates for each corridor. For this preliminary study, we relied on traffic projections provided by WisDOT for each of the Interstate corridors. We then made a series of assumptions about possible toll rates, based in part on current toll rates on comparable highways in other states. The projected car and truck traffic over a 40-year period was assembled into a spreadsheet for each corridor to calculate annual toll revenue for each of the years during which toll collection applied (i.e., from the opening of the fully rebuilt corridor). The net present value, in 2010 dollars, was then computed for each corridor's revenue stream.

WisDOT provided a master spreadsheet containing 30 data elements for each segment of each of 10 rural corridors (the same ones included in Table 1, including the planned conversion of US 41 into an Interstate). Data elements included:

•Number of lanes;

•Route miles;

•Lane-miles (route miles multiplied by number of lanes);

•Projected average daily traffic of light vehicles (cars, pickup trucks, SUVs) for 2010, 2020, 2030, and 2040;

•Percentage of truck traffic for 2010, 2020, 2030, and 2040;

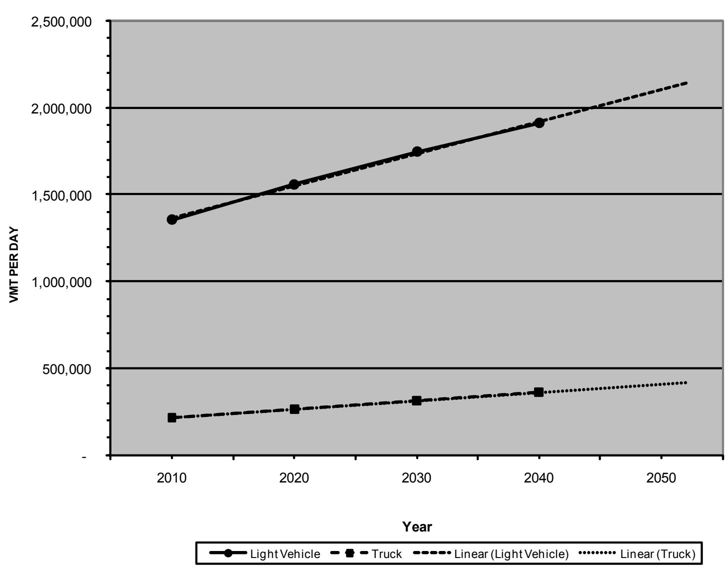
•Daily vehicle miles of travel (VMT) for light vehicles and for trucks, for 2010, 2020, 2030, and 2040;

•Projected level of service (LOS) for 2010, 2030, and 2040. (Levels for 2020 were not projected).

To permit calculation of toll revenue for each year, we interpolated annual VMT figures for cars and for trucks using the WisDOT figures for the planning years of 2010, 2020, 2030, and 2040. And after graphing the data from 2010 through 2040, we extrapolated a VMT figure for 2050 and filled in annual numbers between 2040 and 2050. Figure 3 is a sample graph of the projected car and truck VMT for one of the 10 corridors.

The reconstruction and modernization proposed in this report would be financed up front via the issuance of long-term toll revenue bonds. This is how nearly all toll roads in the United States are paid for.

Figure 3
I-94 Madison to Oconomowoc



Selecting Toll Rates

Using a list of toll agency websites provided by the International Bridge, Tunnel, and Turnpike Association (IBTTA), we selected tolled rural Interstates for which toll rate data were readily available. For each such toll road, we obtained its length in route miles and then found the total amount of toll for a car and a heavy truck, respectively, to travel that distance. In all cases we used the rate available for electronic toll collection (ETC) rather than cash, since ETC rates are generally somewhat lower and since our proposed Wisconsin tolling would be all ETC. That enabled calculation of the average toll rate per mile for cars and for heavy trucks on each toll road. These results are provided in Table 7.

Because Illinois is a neighboring state, we included the four principal Illinois Tollway routes, even though some of them are more suburban than rural in nature. As can be seen from Table 7, the average Illinois car toll rate is slightly lower than the average of the other states, while its average truck toll rate is significantly higher. Excluding Illinois, the average toll rate for cars is 5 cents per mile; the average for trucks is 20 cents per mile.

In selecting toll rates to use in this preliminary Wisconsin study, we took several factors into account. First, since one objective was to cover the costs of rebuilding, operating, and maintaining the state's Interstates, the toll rates should be high enough to be in the range of being able to do so. The rates shown in Table 7 reflect toll roads of varying ages and rate-setting policies; were those toll roads all newly constructed, at today's construction costs, many of those toll rates would be significantly higher.

On the other hand, Economics 101 teaches us that the higher the price of a service, the smaller the number of customers it will attract. We did not want to select toll rates that would lead a large fraction of current users to refuse to use Wisconsin's Interstates and to divert to other highways. Any toll road traffic and revenue study must always estimate a "diversion rate"—the fraction of vehicles that will not use the road at a given level of toll.

Taking both sets of considerations into account, we selected the *national average* rates of 5 cents per mile as the baseline rate for cars and 20 cents per mile as the baseline rate for heavy trucks. (An actual toll rate schedule would likely have a number of different rates, but for preliminary modeling purposes, those two will suffice.) The national-average car rate is about 16% higher than the Illinois car rate per mile, but the national-average truck rate is less than half the Illinois rate (and lower than the truck rates for Indiana, Pennsylvania, and New York).

The baseline rate is what would apply if tolling were to be implemented as of 2010. During the past decade, there has been a strong trend within the tolling community to inflation-adjust toll rates, to keep their real value constant as inflation occurs. Our model incorporates this principle, and we used the average annual Consumer Price Index-Urban over the past 16 years for this purpose: 2.39%.

As noted above, we also had to estimate a diversion rate for cars and for trucks, due to the presence of tolling. The most recent research on introducing tolling as part of rebuilding a rural Interstate comes from the ongoing four-state study of rebuilding I-70 from Kansas City, Mo., to east of Columbus, Ohio. For moderate car toll rates of 5 cents per mile, that study suggests a diversion rate of 10%, and for trucks at 20 cents per mile, a rate of 30%.[15] Those rates were used in the traffic and revenue spreadsheets developed for each of the Wisconsin Interstate corridors.

Estimating Toll Revenue

Previously we defined a set of projects to rebuild the rural Interstates. In Table 1 we indicated a start date for each construction project, beginning with three corridors in 2015 and with the last corridor starting construction work in 2040. In a generic model of this sort, we make a number of simplifying assumptions. One of them is that each of these projects is of five years' duration, at the end of which the construction work is completed and electronic tolling then begins. Thus, the start date for a corridor's tolling is five years after the construction-start date given in Table 1.

For each corridor, we begin with the 40-year projection of car and truck VMT, as shown by the example of Corridor 10 in Table 8. After the year, the next two columns give the basic projection of car VMT and truck VMT, as discussed previously. After that, the following two columns provide the net VMT, after accounting for the diversion rates. Net VMT is the same as gross VMT until the year tolling begins, in this case in 2020. The columns after that show the CPI-adjusted toll rate, for cars and trucks respectively. Daily toll revenue for each vehicle type is simply the toll rate times the daily VMT for that year. Car and truck revenue are combined to give total daily revenue, and that figure is multiplied by 365 days to provide gross annual revenue. As is customary in toll revenue projections, we then adjust gross revenue, allotting 10% for operating and maintenance costs, to yield net toll revenue. This is what is available that year to pay debt service on toll revenue bonds that would be issued to finance the construction. The last two columns simply use a 6% discount rate to compute the net present value (NPV) of the toll revenue, for the same baseline year (2010) that was used to compute the NPV of project costs. The sum of the annual NPV values is the total NPV of the revenue stream—for this corridor, $563 million in 2010 dollars.The same procedure was followed for all 10 rural Interstate corridors.

Table 7
2010 Toll Rates, Major State Toll Roads

	Route Miles	Cars ETC Rate	Trucks ETC Rate	Rate/mile cars	Rate/mile trucks	% trucks	Weighted Average Rate
OHIO TURNPIKE	241	$10.25	$32.00	$0.043	$0.133	34%	$0.073
INDIANA TURNPIKE	157	$4.65	$35.14	$0.030	$0.224	18%	$0.065
PA TURNPIKE MAINLINE	329	$25.45	$137.80	$0.077	$0.419	14%	$0.125
KANSAS TURNPIKE	236	$9.25	$28.25	$0.039	$0.120	13%	$0.050
WV TURNPIKE	88	$3.90	$16.20	$0.044	$0.184	23%	$0.076
FL TURNPIKE MAINLINE	262	$14.15	$40.25	$0.054	$0.154	6%	$0.060
NY THRUWAY MAINLINE	496	$21.61	$114.44	$0.044	$0.231	n.a.	n.a.
OK, CHEROKEE	33	$2.40	$8.30	$0.073	$0.252	10%	$0.091
OK, CHICKSAW	17	$0.55	$1.90	$0.032	$0.112	10%	$0.040
OK, INDIAN NATION	105	$5.30	$17.30	$0.050	$0.165	10%	$0.062
AVERAGE NON-IL				$0.049	$0.199		
IL, ADDAMS	79	$3.30	$33.00	$0.042	$0.418	10%	$0.079
IL, TRI-STATE	78	$3.75	$37.50	$0.048	$0.481	10%	$0.091
IL, REAGAN	141	$3.10	$31.00	$0.022	$0.220	10%	$0.042
IL, VETERANS	32.5	$2.00	$16.00	$0.062	$0.492	10%	$0.105
AVERAGE IL TOLL RATE				$0.043	$0.403		
WEIGHTED AVERAGE OVERALL TOLL RATE							$0.07

Table 8
Traffic and Revenue Projection I-94 Rural Corridor

Year	Light Vehicle VMT (per day)	Truck VMT (per day)	Net Light Vehicle VMT	Net Truck VMT	Light Vehicle Toll Rate (per mile)	Truck Toll Rate (per mile)	Daily Light Vehicle Toll Revenue	Daily Truck Toll Revenue	Daily Toll Revenue	Gross Annual Toll Revenue	Net Annual Toll Revenue	NPV Factor	NPV Revenue
2010	1,355,344	217,576	1,355,344	217,576	$0.0500	$0.2000	$0	$0	$0	$0	$0	1.0000	$0
2011	1,375,866	222,348	1,375,866	222,348	$0.0512	$0.2048	$0	$0	$0	$0	$0	0.9434	$0
2012	1,396,388	227,120	1,396,388	227,120	$0.0524	$0.2097	$0	$0	$0	$0	$0	0.8900	$0
2013	1,416,910	231,892	1,416,910	231,892	$0.0537	$0.2147	$0	$0	$0	$0	$0	0.8396	$0
2014	1,437,432	236,664	1,437,432	236,664	$0.0550	$0.2198	$0	$0	$0	$0	$0	0.7921	$0
2015	1,457,955	241,437	1,457,955	241,437	$0.0563	$0.2251	$0	$0	$0	$0	$0	0.7473	$0
2016	1,478,477	246,209	1,478,477	246,209	$0.0576	$0.2304	$0	$0	$0	$0	$0	0.7050	$0
2017	1,498,999	250,981	1,498,999	250,981	$0.0590	$0.2360	$0	$0	$0	$0	$0	0.6651	$0
2018	1,519,521	255,753	1,519,521	255,753	$0.0604	$0.2416	$0	$0	$0	$0	$0	0.6274	$0
2019	1,540,043	260,525	1,540,043	260,525	$0.0618	$0.2474	$0	$0	$0	$0	$0	0.5919	$0
2020	1,560,565	265,297	1,404,509	185,708	$0.0633	$0.2533	$88,934	$47,037	$135,971	$49,629,412	$44,666,471	0.5584	$24,942,522
2021	1,578,938	270,062	1,421,044	189,044	$0.0648	$0.2593	$92,132	$49,026	$141,158	$51,522,618	$46,370,356	0.5268	$24,428,400
2022	1,597,311	274,828	1,437,580	192,379	$0.0664	$0.2655	$95,432	$51,083	$146,515	$53,477,970	$48,130,173	0.4970	$23,920,370
2023	1,615,684	279,593	1,454,115	195,715	$0.0680	$0.2719	$98,836	$53,211	$152,048	$55,497,358	$49,947,622	0.4689	$23,418,612
2024	1,634,057	284,359	1,470,651	199,051	$0.0696	$0.2784	$102,349	$55,412	$157,761	$57,582,725	$51,824,453	0.4423	$22,923,289
2025	1,652,430	289,124	1,487,187	202,387	$0.0713	$0.2850	$105,974	$57,687	$163,660	$59,736,073	$53,762,465	0.4173	$22,434,544
2026	1,670,802	293,889	1,503,722	205,723	$0.0730	$0.2918	$109,713	$60,039	$169,752	$61,959,458	$55,763,512	0.3937	$21,952,504
2027	1,689,175	298,655	1,520,258	209,058	$0.0747	$0.2988	$113,570	$62,471	$176,041	$64,254,999	$57,829,499	0.3714	$21,477,279
2028	1,707,548	303,420	1,536,793	212,394	$0.0765	$0.3060	$117,550	$64,984	$182,534	$66,624,876	$59,962,388	0.3504	$21,008,963
2029	1,725,921	308,186	1,553,329	215,730	$0.0783	$0.3133	$121,654	$67,582	$189,237	$69,071,329	$62,164,196	0.3305	$20,547,637
2030	1,744,294	312,951	1,569,865	219,066	$0.0802	$0.3208	$125,888	$70,268	$196,155	$71,596,666	$64,437,000	0.3118	$20,093,368

Table 8 (Continued)

Year	Light Vehicle VMT (per day)	Truck VMT (per day)	Net Light Vehicle VMT	Net Truck VMT	Light Vehicle Toll Rate (per mile)	Truck Toll Rate (per mile)	Daily Light Vehicle Toll Revenue	Daily Truck Toll Revenue	Daily Toll Revenue	Gross Annual Toll Revenue	Net Annual Toll Revenue	NPV Factor	NPV Revenue
2031	1,761,065	317,754	1,584,959	222,427	$0.0821	$0.3284	$130,136	$73,051	$203,187	$74,163,170	$66,746,853	0.2942	$19,635,597
2032	1,777,836	322,556	1,600,053	225,789	$0.0841	$0.3363	$134,515	$75,928	$210,442	$76,811,455	$69,130,310	0.2775	$19,185,702
2033	1,794,607	327,359	1,615,147	229,151	$0.0861	$0.3443	$139,029	$78,900	$217,929	$79,543,966	$71,589,569	0.2618	$18,743,677
2034	1,811,378	332,161	1,630,241	232,513	$0.0881	$0.3525	$143,682	$81,971	$225,653	$82,363,215	$74,126,894	0.2470	$18,309,510
2035	1,828,150	336,964	1,645,335	235,874	$0.0902	$0.3610	$148,478	$85,143	$233,621	$85,271,788	$76,744,609	0.2330	$17,883,177
2036	1,844,921	341,766	1,660,429	239,236	$0.0924	$0.3696	$153,422	$88,421	$241,842	$88,272,344	$79,445,110	0.2198	$17,464,648
2037	1,861,692	346,569	1,675,523	242,598	$0.0946	$0.3784	$158,516	$91,806	$250,322	$91,367,619	$82,230,857	0.2074	$17,053,886
2038	1,878,463	351,371	1,690,617	245,960	$0.0969	$0.3875	$163,767	$95,303	$259,070	$94,560,426	$85,104,383	0.1957	$16,650,847
2039	1,895,234	356,174	1,705,711	249,321	$0.0992	$0.3967	$169,178	$98,914	$268,092	$97,853,659	$88,068,293	0.1846	$16,255,482
2040	1,912,005	360,976	1,720,805	252,683	$0.1016	$0.4062	$174,754	$102,644	$277,398	$101,250,294	$91,125,265	0.1741	$15,867,736
2041	1,928,776	365,779	1,735,898	256,045	$0.1040	$0.4159	$180,500	$106,495	$286,996	$104,753,394	$94,278,055	0.1643	$15,487,547
2042	1,945,547	370,581	1,750,992	259,407	$0.1065	$0.4259	$186,421	$110,472	$296,893	$108,366,107	$97,529,496	0.1550	$15,114,851
2043	1,962,318	375,384	1,766,086	262,768	$0.1090	$0.4360	$192,522	$114,578	$307,100	$112,091,671	$100,882,504	0.1462	$14,749,579
2044	1,979,089	380,186	1,781,180	266,130	$0.1116	$0.4465	$198,808	$118,818	$317,626	$115,933,417	$104,340,075	0.1379	$14,391,657
2045	1,995,861	384,989	1,796,274	269,492	$0.1143	$0.4571	$205,285	$123,194	$328,479	$119,894,771	$107,905,294	0.1301	$14,041,007
2046	2,012,632	389,791	1,811,368	272,854	$0.1170	$0.4681	$211,957	$127,712	$339,669	$123,979,255	$111,581,330	0.1228	$13,697,551
2047	2,029,403	394,594	1,826,462	276,215	$0.1198	$0.4792	$218,832	$132,375	$351,207	$128,190,493	$115,371,444	0.1158	$13,361,204
2048	2,046,174	399,396	1,841,556	279,577	$0.1227	$0.4907	$225,913	$137,189	$363,102	$132,532,209	$119,278,989	0.1093	$13,031,880
2049	2,062,945	404,199	1,856,650	282,939	$0.1256	$0.5024	$233,208	$142,157	$375,365	$137,008,236	$123,307,413	0.1031	$12,709,492
2050	2,079,716	409,001	1,871,744	286,301	$0.1286	$0.5144	$240,723	$147,284	$388,007	$141,622,514	$127,460,262	0.0972	$12,393,948
													$563,176,469

Toll Financing: Southeastern Wisconsin Freeway System

There are two alternative ways to use tolling on the Interstates and other limited-access routes constituting the southeastern freeway system. One is to do something similar to what has been described earlier for the rural Interstates: apply value-added tolling to each corridor as it is rebuilt and (in many cases) widened. The other would be to develop the new lanes (and only the new lanes) as express toll lanes. Under this alternative, only the new lanes would be tolled, at congestion-priced rates that aim to ensure reliable, uncongested service even during peak periods.

The second alternative was proposed in a previous study, published early in 2006.[16] At that time, the *Regional Freeway System Reconstruction Plan for Southeastern Wisconsin* had been completed and released (in 2003), but funding for this huge project had not been determined.[17] The FAST Lanes study proposed that an initial 59 lane-miles of congestion-priced lanes be added to the inner core of the freeway system. Sketch-level analysis in the study suggested that toll revenues from these lanes would support a $1 billion bond issue, making a significant contribution toward the cost of what was then estimated to be a $6.2 billion freeway reconstruction program. While campaigning for governor in fall 2010, Gov. Scott Walker endorsed adding express toll lanes to major urban highways (while opposing conversion of all lanes to tolling).[18]

For express toll lanes to provide the greatest operational benefits in an urban freeway system, they should make up a seamless network. That means where two freeways intersect at an interchange, it should be possible for toll lane users to transition directly from the toll lane on one freeway to the toll lane on the intersecting freeway. And that requires building direct-connector (flyover) ramps between the toll lanes. Without such direct connectors, those who pay the premium toll for fast and reliable rush-hour trips would have to exit the toll lane prior to the interchange, work their way across several congested lanes of traffic in the general-purpose lanes to transition to the intersecting freeway, and once on the new freeway cut across several more congested lanes to enter the toll lane on the new freeway. Such flyover ramps are not included in SEWRPC's current freeway reconstruction plans, and adding them would add a significant cost to the now-estimated $7.9 billion (2009 dollars) cost. And the first phase of the reconstruction, I-94 from the Illinois line to somewhat north of the Mitchell Interchange, is under construction without providing for separate express lanes or flyover connectors.

Nevertheless, we believe the express toll lanes approach is more likely to be politically acceptable than congestion pricing of all lanes (as would be permitted under the federal Value Pricing Program). We have modeled an express toll lanes scenario without the addition of flyover connectors for these new lanes at freeway interchanges (though we recommend that this be considered if an express toll lanes approach is actually pursued). For modeling purposes, we assume that the new lanes added on the following corridors be equipped for electronic tolling and operated as express toll lanes (ETLs):

Table 9
Express Toll Lane Corridors

Corridor Number	Route	From	To	Year Tolling Begins
13	I-43	I-894	I-94/794	2025
14	I-43	I-94/794	Cedar Grove	2020
15	US 45	I-94	U.S. 41	2020
16	I-94	Oconomowoc	I-43/794	2025
17	I-94	Illinois line	I-43	2015
19	I-894	I-43	I-94	2020

A number of assumptions are needed in order to estimate the toll revenue. As in the 2006 FAST lanes study, we assume that the principal market for ETLs is during the five peak hours on weekdays, while recognizing that some will be willing to pay a lower toll rate to use the ETLs at other hours or on weekends. We also assume that 35% of total daily usage takes place during the five weekday peak hours. Given that all six of the above corridors are projected to be congested at LOS E or F during most of the 40-year period used for traffic and revenue estimation, we assume that each ETL will be able to operate at the practical free-flow maximum of 1,600 vehicles/lane/hour in the peak direction during peak periods. In the early years, we assume that flows in the non-peak direction will be half that level (800 vehicles/lane/hour), and that this non-peak-direction flow gradually increases over the 40-year period. Thus, the average (peak-direction and non-peak direction) ETL traffic during peak periods begins at 1,200 (average of 1,600 and 800) vehicles/lane/hour in 2015 and reaches 1,900 by the end of the projection period in 2050.

In the 2006 FAST lanes study, a first-year peak-period toll rate was derived by comparing the level of traffic congestion in Milwaukee with that in San Diego and Orange County, Calif., where similar-priced lanes have been in operation for many years. For the present study, we take the 2005 peak toll rate of 15 cents/mile and inflation-adjust it (using the 2.39% average annual CPI increase) to 2010 (16.88 cents/mile). This becomes the new starting toll rate, for peak periods only, in the traffic and revenue estimation process.

The spreadsheet for ETL traffic and revenue is shown in Table 10. As can be seen, the number of route-miles with ETLs begins at 30.16 miles when the initial (I-94) corridor begins operations in 2015. As additional corridors are completed and new ETLs become operational, this number increases to 83.62 route-miles in 2020, and 128.1 route-miles in 2025. The column showing peak-period toll revenue is calculated by multiplying the number of route-miles by two (to get ETL lane-miles) and multiplying that by five hours per day and the average peak toll rate. Daily peak-period revenue is multiplied by 250 weekdays per year to give annual peak revenue. Using the estimate from the Orange County 91 Express Lanes that 29% of annual revenue comes from non-peak and weekend traffic, the next column shows annual non-peak revenue. Peak and non-peak revenue are added together to give annual gross revenue, and 90% of that is defined as annual net revenue. The last two columns provide the net present value calculation, yielding an NPV of net ETL revenue of $1.5 billion in 2010 dollars.

A Value-Added Tolling/Congestion Pricing Alternative

Since the express toll lanes approach modeled above produces only a small fraction of the toll revenue needed to pay for rebuilding the southeastern freeway system, we have also modeled an approach using the value-added tolling approach with congestion pricing applied to all lanes, as would be permitted under the federal Value Pricing Program. We use the same schedule of freeway corridor reconstruction as before, but in this case the base rate for cars and other light vehicles on all lanes during peak periods would be 15 cents/mile, reverting to 5 cents/mile during all other hours (the same as on the rural interstates). During peak periods, trucks would pay the same 20 cents/mile as charged on rural Interstates but would receive a large discount during all other hours, at 12 cents/mile. This would provide an incentive for those trucking operators who could do so to schedule their use of the freeways outside of peak hours. For both cars and trucks, we assumed that 42% of their use would take place during peak hours and the balance at other times. That yields a baseline (2010) average daily toll rate of 9.2 cents/mile for cars and 15.4 (rounded to 15) cents/mile for trucks.

Those toll rates were used to create traffic and revenue spreadsheets for each of the nine urban freeway corridors previously defined in Table 4. As before, tolling would begin as each rebuilt corridor was opened to traffic, modeled as occurring five years after the start of reconstruction of each. Under these assumptions, the NPV of revenues for the nine corridors was computed to be $6.186 billion.

Table 10
Express Toll Lanes Traffice and Revenue

Year	Route Miles	Weekday ETL Peak Veh/ln/Hr	Average Peak Toll	Peak Revenue/ Weekday	Annual Peak Revenue	Annual Non-Peak Revenue	Annual Gross Revenue	Annual Net Revenue	NPV Factor	NPV Revenue
2010	0	0	0.1688	$0	$0	$0	$0	$0	1.0000	$0
2011	0	0	0.1728	$0	$0	$0	$0	$0	0.9434	$0
2012	0	0	0.1770	$0	$0	$0	$0	$0	0.8900	$0
2013	0	0	0.1812	$0	$0	$0	$0	$0	0.8396	$0
2014	0	0	0.1855	$0	$0	$0	$0	$0	0.7921	$0
2015	30.16	1200	0.1900	$68,750	$17,187,502	$4,984,375	$22,171,877	$19,954,689	0.7473	$14,912,139
2016	30.16	1200	0.1945	$70,393	$17,598,283	$5,103,502	$22,701,785	$20,431,606	0.7050	$14,404,282
2017	30.16	1200	0.1991	$72,076	$18,018,882	$5,225,476	$23,244,357	$20,919,922	0.6651	$13,913,840
2018	30.16	1200	0.2039	$73,798	$18,449,533	$5,350,365	$23,799,898	$21,419,908	0.6274	$13,438,850
2019	30.16	1200	0.2110	$76,381	$19,095,267	$5,537,627	$24,632,894	$22,169,605	0.5919	$13,122,189
2020	83.62	1300	0.2184	$237,447	$59,361,793	$17,214,920	$76,576,713	$68,919,042	0.5584	$38,484,393
2021	83.62	1300	0.2261	$245,758	$61,439,456	$17,817,442	$79,256,898	$71,331,208	0.5268	$37,577,280
2022	83.62	1300	0.2340	$254,359	$63,589,837	$18,441,053	$82,030,889	$73,827,800	0.4970	$36,692,417
2023	83.62	1300	0.2422	$263,262	$65,815,481	$19,086,489	$84,901,970	$76,411,773	0.4689	$35,829,481
2024	83.62	1300	0.2507	$272,476	$68,119,023	$19,754,517	$87,873,539	$79,086,185	0.4423	$34,979,820
2025	128.1	1400	0.2594	$465,256	$116,314,112	$33,731,092	$150,045,204	$135,040,684	0.4173	$56,352,477
2026	128.1	1400	0.2685	$481,540	$120,385,106	$34,911,681	$155,296,786	$139,767,108	0.3937	$55,026,310
2027	128.1	1400	0.2779	$498,394	$124,598,584	$36,133,590	$160,732,174	$144,658,957	0.3714	$53,726,336
2028	128.1	1400	0.2876	$515,838	$128,959,535	$37,398,265	$166,357,800	$149,722,020	0.3504	$52,462,596
2029	128.1	1400	0.2977	$533,892	$133,473,119	$38,707,204	$172,180,323	$154,962,291	0.3305	$51,215,037
2030	128.1	1500	0.3081	$592,049	$148,012,155	$42,923,525	$190,935,680	$171,842,112	0.3118	$53,580,370

Table 10 (Continued)

Year	Route Miles	Weekday ETL Peak Veh/ln/Hr	Average Peak Toll	Peak Revenue/ Weekday	Annual Peak Revenue	Annual Non-Peak Revenue	Annual Gross Revenue	Annual Net Revenue	NPV Factor	NPV Revenue
2031	128.1	1500	0.3189	$612,770	$153,192,580	$44,425,848	$197,618,428	$177,856,586	0.2942	$52,325,407
2032	128.1	1500	0.3301	$634,217	$158,554,321	$45,980,753	$204,535,073	$184,081,566	0.2775	$51,082,635
2033	128.1	1500	0.3416	$656,415	$164,103,722	$47,590,079	$211,693,801	$190,524,421	0.2618	$49,879,293
2034	128.1	1500	0.3536	$679,389	$169,847,352	$49,255,732	$219,103,084	$197,192,776	0.2470	$48,706,616
2035	128.1	1600	0.3659	$750,046	$187,511,477	$54,378,328	$241,889,805	$217,700,824	0.2330	$50,724,292
2036	128.1	1600	0.3788	$776,298	$194,074,378	$56,281,570	$250,355,948	$225,320,353	0.2198	$49,525,414
2037	128.1	1600	0.3920	$803,468	$200,866,982	$58,251,425	$259,118,406	$233,206,566	0.2074	$48,367,042
2038	128.1	1600	0.4057	$831,589	$207,897,326	$60,290,225	$268,187,550	$241,368,795	0.1957	$47,235,873
2039	128.1	1600	0.4199	$860,695	$215,173,732	$62,400,382	$277,574,115	$249,816,703	0.1846	$46,116,163
2040	128.1	1700	0.4346	$946,495	$236,623,864	$68,620,920	$305,244,784	$274,720,306	0.1741	$47,828,805
2041	128.1	1700	0.4498	$979,623	$244,905,699	$71,022,653	$315,928,352	$284,335,517	0.1643	$46,716,325
2042	128.1	1700	0.4656	$1,013,910	$253,477,398	$73,508,446	$326,985,844	$294,287,260	0.1550	$45,614,525
2043	128.1	1700	0.4819	$1,049,396	$262,349,107	$76,081,241	$338,430,349	$304,587,314	0.1462	$44,530,665
2044	128.1	1700	0.4987	$1,086,125	$271,531,326	$78,744,085	$350,275,411	$315,247,870	0.1379	$43,472,681
2045	128.1	1800	0.5162	$1,190,266	$297,566,389	$86,294,253	$383,860,641	$345,474,577	0.1301	$44,946,242
2046	128.1	1800	0.5343	$1,231,925	$307,981,212	$89,314,552	$397,295,764	$357,566,187	0.1228	$43,909,128
2047	128.1	1800	0.5530	$1,275,042	$318,760,555	$92,440,561	$411,201,115	$370,081,004	0.1158	$42,855,380
2048	128.1	1800	0.5723	$1,319,669	$329,917,174	$95,675,980	$425,593,154	$383,033,839	0.1093	$41,865,599
2049	128.1	1800	0.5924	$1,365,857	$341,464,275	$99,024,640	$440,488,915	$396,440,023	0.1031	$40,872,966
2050	128.1	1900	0.6131	$1,492,199	$373,049,721	$108,184,419	$481,234,140	$433,110,726	0.0972	$42,098,363
										$1,504,391,234

A detailed tolling feasibility study would estimate toll rates specific to each corridor. It would also develop more detailed cost and timing estimates for each corridor. And it would use various factors to estimate how much revenue could likely be raised in the form of toll revenue bonds and other financing tools, probably for each individual corridor.

This sketch-level study could do only a generic analysis, using standardized cost estimates, standardized toll rates (the same for each corridor), and an approximation of project timing and phasing. This is consistent with this study's objective of providing a first look at the extent to which toll financing is a viable means of paying for the very large costs of reconstructing and modernizing both the rural Interstate system and the southeastern freeway system.

A way to assess basic feasibility is to compare the net present value of the toll revenues with the net present value of project costs. If they are relatively close in value, then it is plausible that tolling could provide at least a large part of the resources to make the project possible. If the NPV of revenue is only a modest fraction of the NPV of cost, then tolling would not be a very powerful tool to finance the project.

Previously we developed the costs for each of the rural and urban corridors and computed the relevant NPV for each of these projects. In Toll Financing, page 18, we estimated toll revenues for the 10 rural corridors and did the same on page 24 for the express toll lanes on six urban freeway corridors, as well as for the all-lanes-priced alternative. That enables us to do the NPV financial feasibility assessment in this section.

Table 11 pulls together the NPV of cost and the NPV of revenue for the rural Interstate corridors. As can be seen, several of the corridors are financially feasible based on toll revenues alone, at this initial level of analysis. Several others are far below being self-supporting, such as the I-39 corridor between Portage and Wausau. Overall, the NPV of revenues exceeds the NPV of costs by $455 million for this $4.8 billion (NPV) reconstruction. On a systemwide basis, this suggests that tolls could finance the overall rural Interstate reconstruction and modernization program.

Table 11
NPV of Costs and Revenues, Rural Interstate Corridors

Corridor	NPV of Costs in millions of dollars	NPV of Revenues in millions of dollars	Difference in millions of dollars
I-39/I-90 Illinois to Madison	$294	$987	$693
I-39/90/94 Madison to Portage	$213	$859	$646
I-39 Portage to Wausau	$409	$98	-$311
U.S. 41 Allenton to Green Bay	$1,323	$1,198	-$125
I-43 Beloit to Darien	$72	$41	-$31
I-43 Cedar Grove to Green Bay	$354	$230	-$124
I-90 Minnesota to Tomah	$209	$133	-$76
I-90/94 Tomah to Portage	$342	$584	$242
I-94 Minnesota to Tomah	$644	$546	-$98
I-94 Madison to Oconomowoc	$924	$563	-$361
Totals:	**$4,784**	**$5,239**	**$455**

For the urban corridors, we carried out two different modeling exercises. Our preferred approach modeled tolling only the new lanes, which are proposed for addition to six of the nine corridors. We previously derived, in Table 6, the NPV of the cost of the southeastern freeway system reconstruction, at $8.75 billion (in 2010 dollars). The NPV of net revenue from the six-corridor ETL system was estimated in Table 10 to be $1.5 billion. Thus, while toll revenue from the ETLs could make a significant contribution to the overall cost of the freeway reconstruction, our estimate is that it would cover 17 percent of the cost.

Should there be political support to opt instead for tolling all lanes on the southeastern freeway system, in order to pay for a larger share of the cost, the NPV analysis of that approach is shown in Table 12. As can be seen, this alternative approach would cover 71% of the cost from toll revenues.

SEWRPC's long-range transportation plan presents the southeastern freeway system reconstruction plan as being covered by projected transportation funding sources (consistent with that plan meeting the federal definition of being "fiscally constrained"). However, that plan assumes the continuation of historical transportation revenue trends. Our assessment is that those historical revenue trends are unlikely to continue, given the likely decline (in real terms) of federal and state fuel tax revenues, and the commitment of a portion of Wisconsin vehicle registration fee revenues to pay debt service on bonds issued during the past decade. Our first alternative, express toll lanes, would provide $1.5 billion from tolls on the new lanes, covering about 17% of the reconstruction cost. The politically more difficult approach of tolling all lanes, as each part of the southeastern freeway system is rebuilt, would generate about $6.2 billion, covering 71% of the reconstruction cost.

Table 12
NPV of Costs and Revenues, Urban Freeway Corridors, All Lanes Tolled

Corridor	NPV of Costs in millions of dollars	NPV of Revenues in millions of dollars	Difference in millions of dollars
U.S. 41 Milwaukee to Allenton	$635	$606	-$29
I-43 Darien to Milwaukee	$598	$284	-$314
I-43 Hale to Marquette	$544	$414	-$140
I-43 Marquette to Cedar Grove	$1,658	$1,040	-$614
U.S. 45, Zoo to U.S. 41	$426	$527	$101
I-94 Oconomowoc to Marquette	$1,644	$1,269	-$375
I-94 Illinois line to I-43	$1,710	$1,778	$68
I-794	$126	$24	-$102
I-894 Hale to Zoo, + Zoo Interchange	$1,398	$244	-$1,154
Totals:	**$8,749**	**$6,186**	**-$2,563**

Conclusion

This study has identified and quantified the major investment needed over the next 30 years to rebuild and modernize the Interstate highways in Wisconsin, including the southeastern freeway system. In build-year dollars, the rural Interstate program is estimated to cost $12.5 billion and the southeastern freeway system reconstruction another $13.7 billion, for a total of $26.2 billion between now and 2040.

Funding of this magnitude almost certainly will not be available from existing state and federal transportation sources. In recent years, the total state highway construction budget has been between $1 billion and $1.5 billion per year. A large fraction of this money is spent on the 11,000 miles of the state highway system other than the 743 miles of the Interstates. Federal and state fuel tax revenues have been declining in real terms in recent years and are projected to keep doing so. Vehicle registration fee revenue is, in part, committed to debt service on highway revenue bonds issued since 2003 to make up for shortfalls in transportation revenue, including transfers from the transportation fund to the state's general fund.

What is needed to ensure the timely reconstruction of the Interstates and southeastern freeway system is a net new revenue source. This study finds that value-added tolling could be that new revenue source. Using up-to-date estimates of construction costs and moderate levels of toll rates for cars and trucks, the rural Interstate reconstruction program appears to be fundable based solely on toll revenue. The southeastern freeway system reconstruction, based on the implementation of the new lanes as express toll lanes, could be assisted meaningfully by the toll revenue derived from those new lanes. If the alternative approach of using congestion pricing on all lanes is judged politically acceptable, then nearly three-quarters of the cost of the southeastern freeway system reconstruction could be recovered from tolling. An added benefit for southeastern Wisconsin commuters, in either case, would be reduced congestion and faster and more reliable express bus transit during peak periods, thanks to the pricing system.

Rebuilding aging facilities with toll financing is not unprecedented. Washington state has two such projects under way in the Seattle area: replacing the seismically damaged Alaskan Way Viaduct (State Route 99) with a toll tunnel and replacing the State Route 520 floating bridge with a new toll bridge. Maine and New Hampshire are likewise considering tolling to finance replacements of existing bridges.

Recommendations

While the study team received excellent cooperation from WisDOT throughout the research effort and was impressed with the detailed data available, two important studies appear not to have been done. We therefore recommend that the governor direct WisDOT to do the following in the near future:

1. Develop a needs-based plan for highway reconstruction and modernization over the next 25 to 30 years, regardless of funding constraints. This plan would cover not only the Interstates but the entire 11,773-mile state highway system. The governor, the legislature, and the taxpayers and motorists of Wisconsin need to know the real cost of what WisDOT's highway professionals believe is needed in coming decades, not merely to maintain but to rebuild and modernize the system.

2. Quantify the long-term funding gap between a needs-based, long-term plan and the best possible projection of current transportation funding sources over the same period as the needs-based study.

In the interim, the Wisconsin Policy Research Institute commissioned an outside study to make estimates of highway needs and the next decade's highway funding gap. Released in May 2011, that study estimated a 10-year funding need of $28.56 billion, compared with likely transportation revenues of $18.63 billion.[19] The gap amounts to nearly $1 billion per year. Since this study confirms our assessment that Wisconsin cannot afford the needed reconstruction of its Interstates and freeways based on current funding, our third recommendation is as follows:

3. Commission a professional Interstate tolling feasibility study, based on more detailed construction and phasing plans produced by WisDOT and SEWRPC.

In the near term, with the legislature's permission, several steps could be taken to begin using toll finance in Wisconsin:

•WisDOT could apply to the Federal Highway Administration's Value Pricing Pilot Program to become a "project partner" for urban congestion pricing. With the legislature's consent, the agency should request permission to congestion-toll either the new lanes on I-94 between the Illinois border and the Mitchell Interchange or all the lanes once reconstruction is completed. Toll revenue bonds based on that corridor's revenues could be used to jump-start the next phase of southeastern freeway system reconstruction.

•WisDOT could also apply for the one remaining slot in the FHWA's Interstate System Reconstruction and Rehabilitation Pilot Program, in order to finance the reconstruction of I-39 between the Illinois border and Madison as a toll-financed corridor.

These actions are time-critical, since slots in these pilot programs may no longer be available to Wisconsin a year or two from now.

•Finally, during the 2011 congressional debates on reauthorization of the federal surface transportation program, Wisconsin's representatives in the House and Senate should work toward the removal of limits on the number of projects and number of states allowed in the current Interstate toll pilot programs.

Endnotes

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[3] Benjamin Perez and Steve Lockwood, "Current Toll Road Activity in the U.S.," Office of Transportation Policy Studies, Federal Highway Administration, January 2009 (www.fhwa.dot.gov/ipd/pdfs/2008_toll_activity_white_paper.pdf)

[4] Data provided by WisDOT Division of Transportation Investment Management, Dec. 20, 2010.

[5] Bureau of Transportation Statistics, "Federal Subsidies to Passenger Transportation," U.S. Department of Transportation, December 2004.

[6] David T. Hartgen, et al., *19th Annual Report on the Performance of State Highway Systems (1984-2008)*, Policy Study No. 385, Reason Foundation, September 2010.

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[8] Wisconsin Department of Transportation, *Connections 2030*, p. 9-5

[9] South East Wisconsin Regional Planning Commission, "Review, Update, and Reaffirmation of the Year 2035 Regional Transportation Plan," Appendix Table A-3.

[10] Email to Robert Poole from Greg Wolf at FHWA, Aug. 19, 2010.

[11] Details on this and the other FHWA tolling and pricing programs will be found at: www.fhwa.dot.gov/ipd/revenue/road_pricing/tolling_pricing/index.htm.

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[15] Wilbur Smith Associates, "I-70 Dedicated Truck Lanes Feasibility Study, Attachment A: Sketch Level Traffic and Revenue Study," June 2010. (www.i70dtl.org/images/Final_Summary_Report.pdf)

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[17] Southeastern Wisconsin Regional Planning Council, *A Regional Freeway System Reconstruction Plan for Southeastern Wisconsin*, Planning Report No. 47, May 2003.

[18] Patrick Marley, "Walker Backs Creation of Toll Lanes," *Milwaukee Journal Sentinel*, Oct. 22, 2010.

[19] David T. Hartgen, M. Gregory Fields, and Elizabeth San Jose, *Wisconsin State Highway System: Needs and Resources,* 2011-2020, WPRI Report Volume 24, Number 3, May 2011.

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