FEASIBILITY OF INTERSTATE TOLLING

General Tolling Resource Document

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PREFACE

This general tolling resource document provides an overview of fundamental tolling concepts and conveys the historical context and current applications of tolling for a cross-section of agencies. The document is the first deliverable prepared by HNTB and TranSmart in response to Wisconsin Department of Transportation (WisDOT) project #0900-04-25, addressing the feasibility of state-sponsored Interstate tolling. This document, in conjunction with other analyses, is intended to partially fulfill the requirements of the Transportation Fund solvency study as outlined in Section 9145 (5f), 2015 Wisconsin Act 55.

As the purchasing power of traditional motor fuel tax revenues declines, agencies are increasingly turning to tolling as a reliable source of funding to support surface transportation needs. Technology has accelerated this trend as tolling has moved from cash-based collection to Electronic Toll Collection (ETC) to Open Road Tolling (ORT) and All-Electronic Tolling (AET). This progression has allowed motorists to pay tolls at highway speeds saving time and money. Technological advances have also allowed for more efficient toll collection and led to improved safety, reduced congestion and fewer vehicle emissions that harm the environment.

Agencies use tolling for a variety of purposes, including traffic congestion control; revenue generation for single projects; maintenance of existing systems; and aggressive capital expansion across entire geographic regions. Because different authorities use tolling for different reasons, they have multiple legal tolling frameworks that address when and where tolling may occur; the establishment of a tolling authority; governance and administrative support for the authority; restrictions on authority actions and revenue use; and authority mechanisms to enforce toll payment. An understanding of tolling fundamentals is necessary to address other policy decisions including overall tolling policy, toll rate structure, vehicle classification, toll collection method, and roadside and back-office technology.

This document addresses the feasibility for state-sponsored tolling by first describing the history and progression of tolling in the United States. It then addresses toll operations, including the advantages of newer collection methods and the challenges introduced by those methods. Typical design approaches and technology are discussed as an overview of the different ways in which toll systems operate where the “rubber meets the road.” This document also provides a brief overview of considerations that toll authorities encounter when communicating with key stakeholders, the media and the general public. Finally, there is a summary of existing toll authorities and concrete examples of toll implementation methods utilized by these agencies.

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1. BRIEF TOLLING HISTORY

1.1 History of Tolling in the U.S.

Philadelphia and Lancaster Turnpike Sign

Some may think tolling in the United States is a 20th century development, but user-based financing took root long before our country's founding. The first recorded U.S. toll bridge was in 1656 in Newbury, Massachusetts. Nearly 130 years later, the nation saw its first turnpike, built in 1785 in Virginia. It was soon followed by the opening of the Philadelphia and Lancaster Turnpike in 1792. The first boom in turnpike construction had begun.

After 1800, most states had adopted toll financing for their major roadways. Connecticut had chartered 50 turnpike companies operating 770 miles of roads. New York had 67 such companies chartered to construct 3,110 miles. The turnpike movement eventually spread into many states, and, by 1850, there were hundreds of companies operating thousands of miles of roads.

By the end of the 1920s, more than half of all American families owned automobiles. Engineers kept busy building highways, bridges and tunnels; especially in larger cities, such as New York, Boston, Los Angeles and San Francisco. Tolls were used on many roads, bridges and tunnels to help pay for this building boom. The Holland Tunnel, completed in the mid-1920s, opened routes into the heart of New York City. The iconic Golden Gate Bridge was funded through tolls and built in the 1930s.

The golden age of America's tolling began during World War II, when military strategists envisioned modern, limited-access highways crisscrossing the country and serving both national defense and economic development.

Seven major turnpikes were built either prior to or during the early construction of the Interstate Highway System, including the grandparent of modern-day toll facilities, the Pennsylvania Turnpike, which opened in 1940.

First motorist enters the Pennsylvania Turnpike in 1940

With the passage of the Federal Aid Highway Act of 1956, the Interstate System was established and the need for major toll roads diminished even though their engineering standards would go on to influence the new federally funded system. The Act provided for federal contribution at 90 percent of a project's cost. Additionally, although it allowed toll roads, bridges or tunnels to be designated as part of the Interstate System, it prohibited the use of federal-aid highway funds for reconstruction or improvement of any such toll road. This prohibition on the use of federal-aid highway funds was first amended in 1958. The Federal Aid Highway Act of 1958 established both a general prohibition on toll highways (23 U.S.C. 301) and a limited federal tolling program as an exception to the general prohibition (23 U.S.C. 129).

By 1963, the last of the major toll roads opened, which were planned before the federal-aid system was legislated. Few additional proposals for toll roads were seriously considered for nearly 20 years. However, by 1980, as the Interstate Highway System began to show its age, toll roads re-emerged. The primary concern was the need to stop and pay a toll. However, Electronic Toll Collection (ETC) would soon put that concern to rest. Since the roll out of ETC in 1989, toll customers have enjoyed uninterrupted travel through the use of transponders.

The tolling industry today is an expanded collection of public and private sector toll agencies and state departments of transportation (DOTs), contractors, consultants, vendors and academics. Toll facilities exist in 34 states, with more than five million trips per year. Some experts predict the U.S. toll market will triple in mileage by 2025, and annual toll revenue will grow from around $14 billion today to $60 billion by 2030. Today, the concept of national interoperability, where a toll customer has a single toll transponder and could traverse the entire nation without having to stop and pay a toll or use multiple transponders, is right around the corner.

Since the creation of the federal tolling program in 1958, it has been modified and expanded numerous times throughout the years. Most of the prohibitions applicable to federal highways that are not on the Interstate System have been removed. Although restrictions related to tolling Interstate highways remain, those restrictions also continue to be relaxed. Recent federal highway acts, including TEA-21 (1998), SAFETEA-LU (2005), MAP-21 (2012) and FAST (2015), have eased restrictions in general and have created specific pilot and demonstration projects for interstate tolling.

Some of the changes to the federal tolling program related to Interstates include the ability to convert high-occupancy vehicle (HOV) lanes to high-occupancy toll (HOT) lanes and the ability to toll existing bridges and tunnels that have been reconstructed. The Interstate System Reconstruction and Rehabilitation Pilot Program (ISRRPP) was created by TEA-21 and allowed tolls to be implemented on three reconstructed Interstate facilities. The states that originally applied for and received the three available slots have not yet moved forward under the program. The FAST Act made changes to this

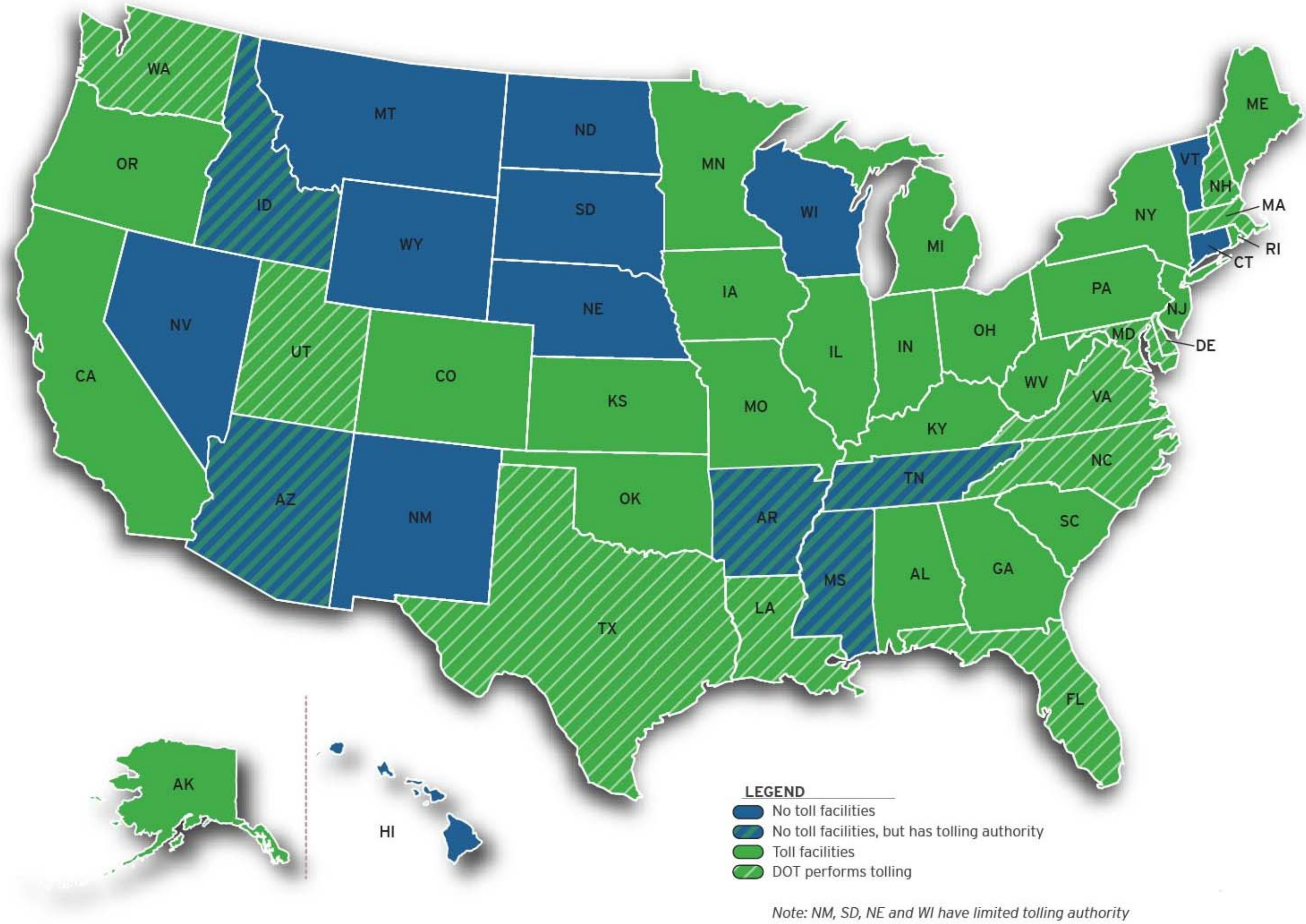

Figure 1-1: States with Toll Facilities

program that will open the three slots to new applicants if the original states do not meet the new requirements of the program. As a result of these and other changes, the number of state DOTs that have tolling operations is expected to expand in the coming decades as traffic demand exceeds conventional funding sources.

1.2 Environmental Justice

In 1994, President Clinton signed Executive Order 12898 (E.O. 12898) directing federal agencies to address the impacts of federal projects on environmental justice communities. Environmental justice communities are certain racial and ethnic minority groups and low income individuals that have historically borne more of the negative impacts of federal projects than the general population as a whole. To help address this inequity, E.O. 12898 mandates that federal agencies must evaluate the adverse impacts that will result from projects and the distribution of those negative impacts amongst the impacted population. If the adverse impacts of the project are anticipated to fall disproportionately to environmental justice communities, the federal agency must evaluate and recommend strategies to minimize and mitigate those disproportionally high adverse impacts.

For transportation projects, the U.S. DOT has incorporated the mandates of E.O. 12898 into the framework of the National Environmental Policy Act (NEPA) and Title VI of the Civil Rights Act of 1964. As projects undergo the normal environmental review process for air quality impacts, noise impacts, water impacts, and various other environmental factors, an analysis is also performed on the impacts of tolling if tolling is part of the project's plan of finance. The tolling impact analysis typically focuses on how the cost of a trip changes with the imposition of a toll. Some users will elect to pay the toll, while other users will elect to pay a penalty in terms of extra travel time in order to take a non-tolled alternative. If increased trip costs to environmental justice communities are greater than the general increase in trip costs, a strategy for minimizing and mitigating the adverse impacts of tolling must be implemented.

There are several strategies available for mitigating the environmental justice impacts of tolling.[1] One commonly used strategy in an all-electronic tolling environment is to target resources to the environmental justice community to educate people on the benefits of, and encourage the use of,

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[1] See SH 121 in Texas and the Ohio River Bridges Project in Kentucky and Indiana for examples of Environmental Justice analyses with respect to tolling.

http://www.keepitmovingdallas.com/sites/default/files/docs/_1_SH121RevisedReevaluation%2012.pdf

http://kyinbridges.com/wp-content/uploads/2015-04-24_EJ-Assessment-Plan.pdf transponder technology. This reduces the overall toll burden by allowing customers to take advantage of the lowest possible toll rates. A second common strategy includes accepting cash at customer service center or retail partner locations as a toll account replenishment option, which removes a significant participation barrier for unbanked and under-banked members of the environmental justice community. Other strategies include marketing campaigns and roadway signage in environmental justice areas to inform travelers about non-tolled alternatives.

As the Federal Highway Administration (FHWA) has focused more attention on environmental justice concerns in recent years, some agencies have considered programs to provide free or reduced-cost tolls to qualified individuals. Initiating such a program requires careful consideration and planning around how to define qualified individuals; how to accurately and efficiently administer the program; what the overall impact to revenue will be; and how the program will be viewed in terms of overall fairness and equity.

1.3 Previous Wisconsin Tolling Studies

1.3.1 Wisconsin Turnpike Commission Biennial Report (1953-1955)

The first official study of turnpikes in Wisconsin, known as the *Wisconsin Turnpike Commission Biennial Report (1953-1955)*[2], commenced in 1953 when the State Legislature formed the Wisconsin Turnpike Commission. The Commission studied “trans-Wisconsin” routes similar to the existing I-90/I-94 route from Beloit to Hudson, with one route option being a Kenosha to Hudson route, and determined that “it would not be feasible to undertake the turnpike construction project in Wisconsin at this time.” The Commission, however, also recommended “that the building of a toll road should not be finally disposed of but, instead, final conclusion be delayed until future developments can be fully appraised.”

The Commission report stated, “The future earnings on the full-length project as reported by Coverdale and Colpits, consulting engineers for traffic and revenue, would not be adequate to support a bond issue of sufficient magnitude to construct the entire project at this time. At current interest rates and under conventional methods of turnpike finance the gross earnings would not be adequate to meet even the interest payments during the early years, let alone provide bond amortization requirements for the full-length project.”

[2] Wisconsin Turnpike Commission. Biennial Report 1953-1955. June 22, 1955. Retrieved from WisDOT library pdf archives on June 20, 2016. Call Number HE 28 .W6 T82 1955; Main Collection, OCLC 13778386, Barcode 13926

The Commission report recommended monitoring, at that time, existing legislation before Congress that would make “substantial amounts of money available for the development of the Interstate highway system.” A substantial part of that system roughly paralleled the Commission’s studied routes, and the report stated the turnpike might not be needed if the federal government were to finance a new Interstate through Wisconsin. Ultimately, the federal government did pass legislation for an Interstate highway system and built the similar I-90/I-94 route as part of that undertaking.

The study estimated initial revenues of $8.5 million per year for the entire 311-mile route in 1960, with revenues increasing to $13.2 million per year by 1970. Total project costs were estimated to be $311.2 million to construct the road. The segment determined to be most feasible was the southern segment between Madison and Illinois.

1.3.2 1975 WisDOT Study “The Use of Tolls for Wisconsin’s Highways”

The emphasis for this report[3], performed by the Wisconsin Department of Transportation’s (WisDOT) Policy and Goal Analysis Section within the Division of Planning, was to “examine the pros and cons of substituting direct user charges on Wisconsin’s highways and streets for the existing system of indirect charges. The direct charges would be fees assessed in proportion to the distance traveled and would vary with the facility used, the vehicle used and the time of day in which the facility was used. The fees could be collected in cash at points of entrance and/or exit from the facility, passes or tickets could be used, or subsequent billing could occur.”

The study discussed various tolling issues within its three sections:

- Theories of highway pricing
- Federal and state statutes
- Existing toll facilities

The study did not focus solely on the Interstate System, but rather looked at the highway program as a whole. The report examined to what extent direct charges for the use of highways and streets could replace the existing indirect method of fee assessment. The report was policy-focused and determined that explicit state and federal statutes did not favor the use of direct user charges in Wisconsin. The report mentioned that there appeared to be unwritten policies in Wisconsin and at the federal level that favor “free roads” and that national congressional interest appeared to lie more in

[3] Wisconsin Department of Transportation. The Use of Tolls for Wisconsin’s Highways. November 21, 1975. Policy and Goal Analysis Section, Division of Planning. Retrieved from WisDOT library pdf archives on June 20, 2016. Call Number HE 336 .T64 W67 1975; Main Collection, OCLC 54769734, Barcode 20324

removing tolls than implementing them. The report did not offer recommendations nor did it identify next steps.

1.3.3 1983 WisDOT Study by Wilbur Smith & Associates "Feasibility of Converting Wisconsin's Interstate to a Toll Road"

In 1983, WisDOT funded a comprehensive study[4] performed by Wilbur Smith and Associates Inc. with sub-consultant HNTB. The purpose of the study was to determine the feasibility of placing tolls on the interstate highways within the state to aid in funding future maintenance and rehabilitation needs. The study was designed to provide WisDOT with sufficient information in order to decide whether the tolling concept should be given further consideration as a viable revenue raising mechanism.

The study focused on traffic and revenue projections, tolling plan options, estimating diversion, and determining likely impacts to tourism. The study did not include a policy analysis. The traffic and revenue scope included a detailed analysis for tolling existing rural interstate segments and a high-level analysis of tolling existing urban interstates within Milwaukee County. The study found tolling to be feasible for both rural and Milwaukee County urban interstate segments:

Table 1-1: 1983 Study – Summary of Results

SEGMENTS	ANNUAL NET REVENUE	ESTIMATED DIVERSION	OUT OF-STATE PERCENT REVENUE
Rural	$26M - $79M	17%	32% - 38%
Urban – Milwaukee County	$13M - $23M	15% - 27%	N/A

The analysis of the rural interstate segments examined three toll concepts, each with a distinct focus:

- Maximize revenue
- Minimize diversion impacts and toll costs to motorists
- Maximize WisDOT's retention of federal aid

[4] Wilbur Smith and Associates, Inc. Technical Report – Feasibility of Converting Wisconsin's Interstate to a Toll Road. Prepared for the Wisconsin Department of Transportation. 1983.

Each of the three rural concepts included a detailed examination of the following:

- Corridor growth analysis
- Toll gantry locations
- Toll price sensitivity analysis
- Diversion
- Typical plaza design and cost
- Highway maintenance and patrol considerations
- Financial feasibility
- Tourism impacts

The rural portion of the study used a range of toll rates from 2 cents per mile to 6 cents per mile, resulting in costs between $0.50 and $1.50 at each gantry. The financial feasibility portion of the analysis included different scenarios of general obligation and revenue bonds used to cover upfront capital costs and provided different scenarios of federal repayments and debt service coverage over a 20-year period. The report did not, however, compare net revenues to estimated rural reconstruction costs of the system or segments of the system.

The high-level urban analysis for the Milwaukee County freeway system addressed four different tolling options. Each option included different toll gantry locations on the freeway mainline. None of the options were closed systems, meaning that a motorist would not pay a toll for some shorter trips. The urban Milwaukee portion of the study assumed toll rates of $0.30 to $1.20 at each mainline gantry, resulting in per average system toll rates of 2.3 cents per mile to 3.8 cents per mile. The report summarized the results by stating, “It is clear that the implementation of toll plazas on the urban Interstate System in Milwaukee County would be financially feasible under any of the four toll concepts studied. In all cases, considerable surplus revenue would be generated after deduction for the cost of constructing, maintaining and operating the toll plazas. Similar to the rural example, the study did not address the reconstruction costs of the interstates in Milwaukee County.”

1.3.4 1996 Reason Foundation Study

In 1996, Robert Poole of the Reason Foundation published a report titled *Private Tollways in Wisconsin*[5]. The report suggested that funding sources available at the time could not handle the reconstruction of major Wisconsin freeways, including the busy Milwaukee area freeway system, and that privately financed tolling would solve a large portion of the funding problem. Specifically, Wisconsin could solicit bids from the private sector for the required $3.1 billion to rebuild and modernize the rural and urban Interstate System and use the tolls charged to users to repay the investment. Poole also suggested the proposed public-private partnership would generate several billion dollars in additional revenues to the State over a 25-year period, which could be applied to a projected $8.9 billion shortfall or be used to cover a portion of local roadway costs paid for by property taxes, thus permitting significant local property-tax relief. The report covered the pros and cons of private investment in highways and tolling in general and suggested the most feasible corridors would be the high-volume interstate corridors of I-43, I-90, I-94, I-894 and I-794. Poole also did a simple feasibility assessment that generated the following findings:

- Reconstructing Wisconsin's rural interstates at 5 cents per mile would produce a commercial rate of return for the developer/operator while also generating billions of dollars in surplus revenue for Wisconsin over 25 years.
- Reconstructing Milwaukee's urban interstates at an assumed cost of $1.9 billion, with a toll charge of 10.5 cents per mile, would result in a strongly positive net present value and therefore be financially feasible.

1.3.5 2011 Wisconsin Policy Research Institute Report

The Wisconsin Policy Research Institute published a report in 2011 titled *Rebuilding and Modernizing Wisconsin's Interstates with Toll Financing*[6]. The report, written by Robert Poole, Jr., assesses the feasibility of tolling the Interstate System to offset the impending cost to reconstruct these aging facilities across the state. Poole outlines the federal guidelines on tolling, along with a methodology for forecasting revenue based on WisDOT data and characteristics of other toll systems in the United States. The sketch level traffic and revenue estimate used 5 cents per mile and 10 percent traffic diversion and estimated that the rural sections of the Interstate System could generate revenue comparable to the cost of reconstruction. The urban corridors in southeast Wisconsin were analyzed

[5] Poole, Robert. Private Tollways for Wisconsin. 1996. Reason Foundation. Retrieved from the Internet 6/18/2016: http://reason.org/files/227510279d97b6b90b8a55c1f2e22199.pdf

[6] Retrieved from the Internet 6/18/2016: http://reason.org/files/rebuilding_wisconsin_interstates_toll_financing.pdf

for an express lane only toll and results indicated that there was no scenario where revenues would cover all reconstruction costs.

Table 1-2: 2011 Report – Summary of Results

INTERSTATE SYSTEM	RECONSTRUCTION COSTS	REVENUE	DIFFERENCE
Rural	$4.78B	$5.24B	+$0.46B
Urban (All lanes tolled)	$8.75B	$6.19B	-$2.56B
Urban (Express lanes tolled)	$8.75B	$1.50B	-$7.25B

All costs are quoted as Net Present Value, in 2009 dollars.

Poole concluded that tolling the Wisconsin Interstate System could generate new revenue to help pay for the impending costs of reconstruction. The report recommended several actions be considered, including:

- Develop a needs-based highway reconstruction plan
- Quantify the long-term transportation funding gap
- Commission an interstate tolling feasibility study
- Apply to FHWA pilot programs to implement tolling

1.4 Wisconsin Transportation Policy and Finance Commission

In January 2013, a legislatively selected panel of citizens, transportation professionals, and lawmakers known as the Wisconsin Transportation Policy and Finance Commission issued their report titled *Keep Wisconsin Moving – Smart Investments, Measureable Results*. The Commission's overall goal was to develop policy changes and financing options to balance projected transportation needs with revenues over the next 10 years.

The report recommended increased transportation investment of $480 million per year to maintain a safe and efficient transportation system and recommended five different options for closing the funding deficit:

- Raise the state motor fuel tax by five cents per gallon
- Adopt new mileage-based registration fees of approximately one cent per mile travelled for passenger cars and light trucks
- Increase annual registration fees for commercial vehicles by 73 percent

- Increase the fee for an eight-year diver license by $20
- Eliminate the sales tax exemption on the trade-in value of a vehicle

Under the Commission's recommendation, fuel taxes and registration fees for the owner of a typical passenger vehicle would increase $120.00 per year, or 33 cents per day.

The Commission report did not recommend tolling as a funding option because of federal restrictions on tolling existing interstate highways. The report did, however, state, "The Commission finds that the State should continue monitoring federal regulations that define the use of tolling and other restrictions that have inhibited Wisconsin's pursuit of this highway financing option. Commissioners encourage the Wisconsin Congressional Delegation to support legislation that allows states more flexibility to toll on the National Highway System."

As of the publishing of this report, the State of Wisconsin has not implemented any of the Commission's funding recommendations.

1.5 Transportation Funding in Wisconsin

Three sources of revenue provide WisDOT with a majority of its transportation funding:

- The State gasoline tax of 30.9 cents per gallon
- State vehicle registration fees of $75 per vehicle
- The federal gasoline tax of 18.4 cents per gallon

These three sources of funding made up 77.5 percent of the State's $3.1 billion 2014 fiscal year transportation revenue, excluding bond funds, according to WisDOT's 2015-2016 Budget Trends report.[7] The remaining funding sources included various fees, taxes and general fund transfers. The federal portion of Wisconsin's transportation revenue for fiscal year 2014, excluding bond funds, was 27 percent.

The buying power of these revenue sources is declining. The State last increased the gasoline tax in 2006 by indexing, while the federal government last increased their gasoline tax in 1993. The State of Wisconsin last raised vehicle registration fees in 2008, from $55 per vehicle to $75. From 2006 to 2015, transportation revenue available to WisDOT in constant 2013 dollars, including bonding,

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[7] Wisconsin Department of Transportation. Transportation Budget Trends 2014-2015. Retrieved from the Internet on 6/20/2016: http://wisconsindot.gov/Documents/about-wisdot/performance/budget/trends2014-15final.pdf

decreased by 5.9 percent. During that time, debt service as a share of WisDOT's annual budget increased from 6.8 percent to 13.6 percent. In summary, over the last ten years, WisDOT has faced decreased transportation funding overall, and debt service has consumed a larger portion of those decreasing funds.

2. TOLL OPERATIONS

Toll facility operations are impacted by the policies, procedures and business rules established by the tolling authority. Toll implementation requires customization to fit the needs of the individual agency, facilities and customers.

2.1 Toll Collection

Toll Lane Collecting Cash Payments

In-lane Automatic Toll Payment Machine

Historically tolls were collected through cash payments made as a vehicle passed designated tolling points. As traffic volume grew over time, requiring vehicles to stop at manned tollbooths resulted in a need for significantly larger toll plazas to mitigate congestion. The additional right of way (ROW) for these large toll plazas increased the cost of constructing new facilities and limited the feasibility of converting existing facilities to toll facilities. Accepting cash at the tolling point is a labor-intensive way to collect tolls. As toll plazas grew to help maintain traffic flow, additional toll collectors were needed. This resulted in increased personnel costs for toll facilities. With many toll collectors handling cash, toll facilities needed extensive controls and audit regimes in place to limit revenue loss. The introduction of automatic coin machines (with collection baskets in coin-only lanes) and automatic toll payment machines (which allowed in-lane automated credit card or cash payments) helped reduce toll collection costs and revenue loss at the tolling point. Although an improvement in terms of the cost effectiveness of collection, the machines did little to improve the limitations resulting from vehicles needing to stop and pay tolls. The bottlenecks and congestion caused by stopping at tollbooths create a safety hazard and impede free-flowing traffic.

2.1.1 Electronic Toll Collection

Toll Plaza with ETC Lanes and Cash Collection Lanes

The introduction of Electronic Toll Collection (ETC) has helped to eliminate congestion and delays on toll roads by collecting tolls without the need for manned tollbooths or automated toll payment toll machines, which reduces collection costs. ETC is a system comprised of a transponder in the driver's vehicle, a reader at the tolling point that identifies the transponder, and a back-office system (BOS) that calculates the toll and deducts it from the driver's account. The back-office is a term generally used to describe the systems and portion of the tolling process that takes place away from the actual toll collection point on the facility, including servers and databases containing customer account information.

ETC facilities require a customer service center (CSC). A customer service center is a staffed facility that serves toll customers. These facilities typically include a walk-in area where most face-to-face customer interactions take place, a phone bank area, management and administration areas, and processing areas. These facilities process toll transactions and manage the customer accounts. Toll customers will often utilize these centers to ask questions, receive or exchange transponders, pay fines or add money to their accounts. Back-office and customer service centers can be operated directly by the tolling authority or by a private company under contract with the tolling authority.

ETC allows for improved traffic flow and also reduces the dependency on cash collection. However, the initial implementations required drivers to slow down in the payment zone to verify payment and for safety reasons. ETC facilities have varying speed limits depending on when and where ETC was implemented. The speed limits range from 5 to 20 miles per hour, and traffic queues occur frequently, especially where gates are used for enforcement. ETC also does not completely eliminate cash as a method of payment, as not all users of the toll facility have a transponder associated with a valid account. The addition of ETC to toll plazas with cash lanes improves throughput but may still result in congestion.

2.1.3 Open Road Tolling


Toll Plaza with ORT Lanes and Cash Collection Lanes

Advances in technology made Open Road Tolling (ORT) possible. ORT uses the same basic process as ETC but allows the customer to travel at highway speeds through the tolling point in dedicated ORT lanes. ORT tolling locations have cash lanes separate from the ORT lanes for vehicles without a toll transponder. Vehicles passing through the ORT lanes without a transponder are charged a violation. Most ORT facilities have systems that take photographic images of a vehicle's license plate for the purpose of enforcing ORT violations.

2.1.4 All-Electronic Tolling


AET Location

All-Electronic Tolling (AET) is a method of collecting tolls using transponders and/or license plate images without the option of the vehicle stopping to pay the toll with cash. AET uses the same technology and processes as ORT but eliminates in-lane cash collection. Those customers without a valid transponder are assessed a toll through a license plate image capture process, commonly referred to as "video billing" or "pay by plate."

Video billing uses photographic images of a vehicle's license plate to identify the registered owner of the vehicle responsible for payment. When a motor vehicle passes through a tolling location and a transponder is not read, a photograph of the vehicle's license plate is captured and the registered owner is invoiced for the amount of the toll.

AET provides significant improvement in traffic, safety, air quality and toll collection costs. Free-flowing traffic reduces congestion at tolling locations and increases the throughput capability of the lanes. Eliminating vehicular weaving and stopping at the tolling locations reduces traffic incidents and increases safety. Air quality also improves due to the reduction in vehicle idle time. Cost savings are realized through lower transaction processing costs, lower capital and maintenance costs associated with toll plazas, and lower labor expenses.

With all lanes traveling at highway speeds, AET reduces ROW requirements and eliminates toll plazas. This significantly reduces implementation barriers for new toll facilities and conversion of existing toll facilities.

Most facilities charge a differential toll to customers that choose video billing. This differential toll represents the increased costs associated with identifying and invoicing the owner of the vehicle. If the invoice is not paid, the registered owner is eventually considered a toll violator and additional enforcement actions are taken by the toll facility operator. AET enforcement processes vary from jurisdiction to jurisdiction but typically involve some procedure to allow alleged violators an opportunity to contest the violation. Depending on the jurisdiction, penalties for violations include fines, vehicle registration blocks, suspension of driving privileges, and vehicle impoundment and forfeiture.

Like ETC and ORT, AET facilities must also have back-office and customer service centers. Due to the additional administrative functions associated with video billing, AET will have more robust back-office operations. With no cash payment option available at the lane level, customer service centers must be more readily available to accommodate cash-only users.

2.2 Enforcement and Reciprocity

Traditionally, toll evasion laws were enforced in the same manner as any other traffic violation. With gated toll systems, evading a toll meant crashing through a gate. This was a rare occurrence and enforcement was effective using traditional policing methods. With the increasing use of AET, operators are developing new technology, legislation and processes to collect payments from ORT and AET toll violators within and outside of their jurisdiction. The point at which a user is considered to be a violator depends on the policies and business rules established by the agency. Pursuing violators creates equity and fairness by ensuring all users of the facility pay their fair share. Effective enforcement also reduces overall system revenue loss.

Most agencies have adopted a civil or quasi-civil process for enforcing toll violations similar to parking violations. Imposing enforcement remedies such as vehicle registration blocks, suspension of driving privileges, and vehicle impoundment and forfeiture is difficult across state lines. Collaboration among multiple entities and across state lines is needed to improve today’s ETC and lay the foundation for the future. An example of multistate coordination lies within the Interstate 95 region where the states of Maine, New Hampshire and Massachusetts have entered into agreements for reciprocal enforcement of out-of-state vehicle toll violations.

2.3 Interoperability

National toll interoperability means that a driver with a valid transponder and registered toll account can travel on any toll road in the U.S. and seamlessly pay the tolls by virtue of the fact that the respective toll agency can collect toll payment directly from that driver's registered toll account. The map in ***Figure 2-1*** shows the regional nature with which toll interoperability has evolved in the United States. Currently there are seven primary tolling protocols in use across the country that roughly approximate distinct geographic regions.

There have been increasing calls from both within and outside the tolling industry to transition away from the regional model to a single, national, interoperable tolling model. One major advantage of a nationally interoperable tolling system is customer convenience. When Congress passed the MAP-21 surface transportation legislation, they included language mandating that tolling authorities become interoperable by October 2016. While interoperability is in progress in many regions, it is not yet complete nationwide.

There are two primary obstacles to overcome in order to meet the federally mandated interoperability deadline. The first is the technological investment required to make the seven current protocols communicate effectively with one another. From a technology standpoint, there are several combinations of transponders and multiprotocol readers that would allow for national interoperability. The challenge is that toll agencies have invested millions of dollars in their current protocols, and millions more will be needed before national interoperability is achieved.

The second challenge is ensuring that toll agencies have business rules that are compatible with one another. Currently, each agency or regional collection of agencies has developed business rules that spell out vehicle classification, define "high-occupancy," and dictate how and when toll monies will be transferred among themselves. Before true national interoperability can be achieved, all toll agencies must adopt changes to their individual rules, or regional agreements, that ensure there are no conflicts in business rules.

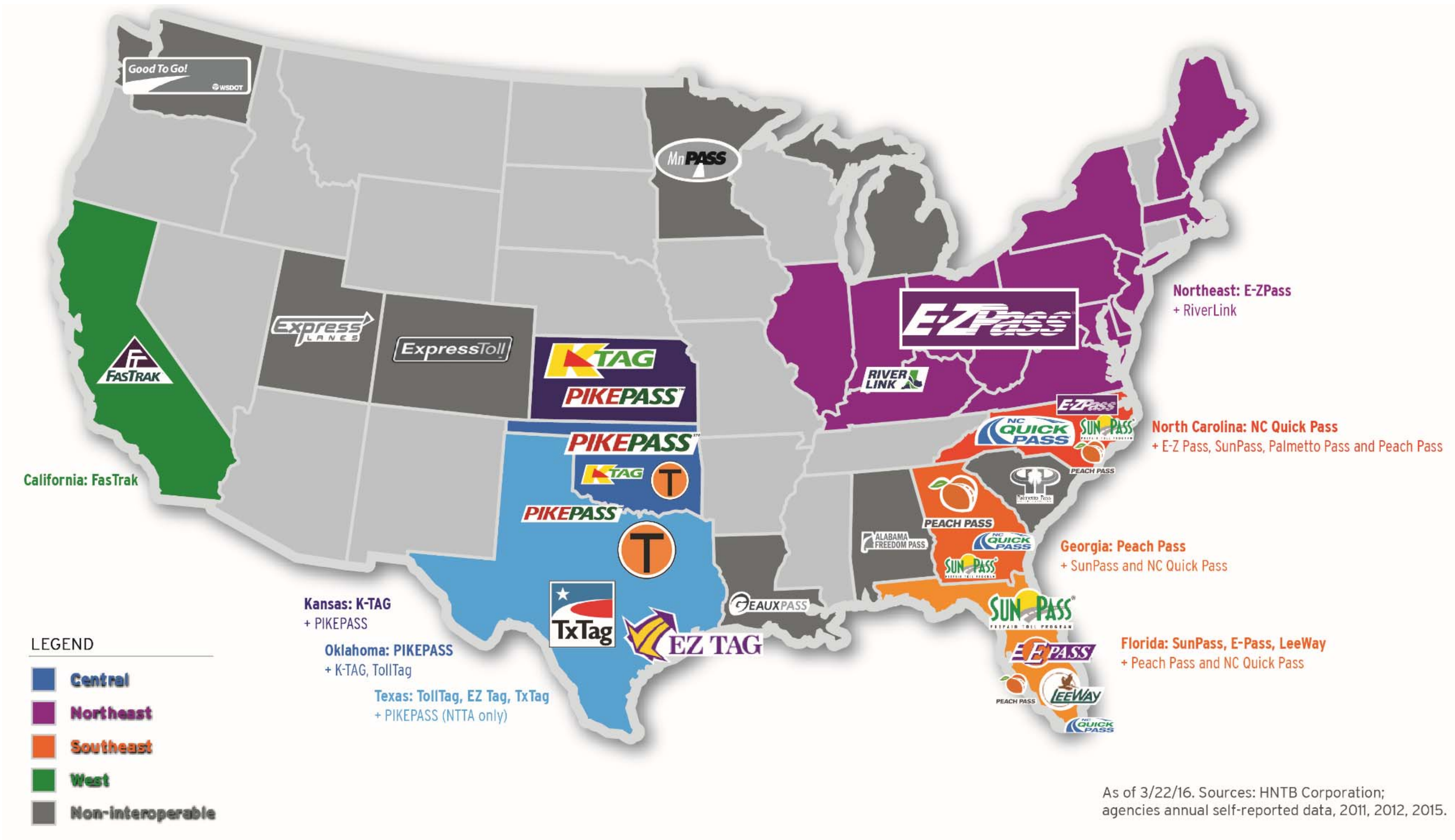


Figure 2-1: U.S. Toll Interoperability

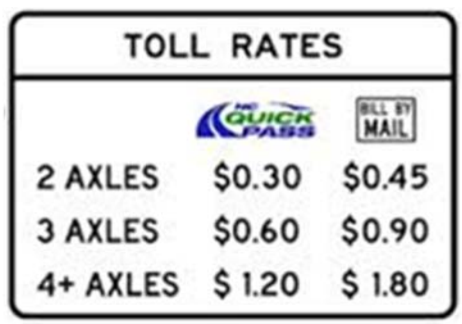
2.4 Pricing and Managed Lanes

2.4.1 Static Pricing

Example of static toll pricing

The traditional concept of toll pricing on toll facilities is based on the premise that all vehicles are charged a flat or static amount to use the facility based simply on an identifiable vehicle classification scheme. Vehicles of a certain classification (2-axle vehicles, for example) pay the same toll amount regardless of the time of day the vehicle's trip is made or the traffic conditions (travel speed, congestion, etc.) encountered on the facility during the trip. For highway segments, the toll amount is often based on the distance traveled. For bridges and tunnels, the toll amount is usually a flat charge paid at either the entry or exit point. Vehicle classification schemes vary, but common factors to establish classification include number of axles, weight, vehicle type or a combination of these factors. When using a statically priced toll facility, motorists may generally use any available traffic lane on the facility.

In addition, static pricing on ETC facilities typically also differentiate toll rates based on the method of payment the customer elects to use to pay the toll. As shown on the example toll rate sign to the right, a differential toll amount results in a lower price for tolls paid by a transponder-based account (NC Quick Pass) as opposed to tolls paid through the plate-based process (Bill by Mail).



Example of static toll pricing with method of payment differentiation (North Carolina Turnpike Authority)

2.4.3 Congestion Pricing

	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
Midnight	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40
1:00 AM	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40
2:00 AM	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40
3:00 AM	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40
4:00 AM	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40
5:00 AM	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40
6:00 AM	$0.40	$2.10	$2.10	$2.10	$2.10	$2.10	$0.40
7:00 AM	$0.40	$3.20	$3.20	$3.20	$3.20	$3.20	$0.40
8:00 AM	$0.40	$2.60	$2.60	$2.60	$2.60	$2.60	$0.40
9:00 AM	$0.40	$1.50	$1.50	$1.50	$1.50	$1.50	$0.40
10:00 AM	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40
11:00 AM	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40
Noon	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40
1:00 PM	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40
2:00 PM	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40
3:00 PM	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40
4:00 PM	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40
5:00 PM	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40
6:00 PM	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40
7:00 PM	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40
8:00 PM	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40
9:00 PM	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40
10:00 PM	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40
11:00 PM	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40	$0.40

Figure 2-2:
Example Time-of-Day Toll Schedule
(Houston's Katy Managed Lanes)

When toll agencies use tolling as a means of managing congestion, they employ variable pricing as opposed to static pricing. The two main categories of variable pricing are time-of-day and dynamic pricing. With time-of-day congestion pricing, toll amounts are set by a fixed schedule based on time of day and/or day of the week. With dynamic congestion pricing, the toll amount changes dynamically based on real-time traffic conditions.

Both time-of-day and dynamic pricing manage congestion by attempting to maintain a minimum level of service (based on traffic density and speed). Increasing toll rates during peak hours of congestion improves travel-time reliability by providing a minimum level of service and travel-time savings. This can encourage drivers to take other routes or to travel at other times. ***Figure 2-2*** depicts a time-of-day toll schedule with the prices changing throughout the day around the morning peak traffic times.

Signs displaying the toll rates on a toll facility which uses congestion pricing often include changeable display components so that drivers can be notified of the toll rate in effect.

2.4.4 Toll Rate Setting

The method by which both initial toll rates and subsequent toll rate increases are set varies from agency to agency. Generally, where tolling is administered by a DOT, toll rates are set by the department's executive. Where tolling is administered by a commission or some other type of board, toll rates are set by the commission or board. Even with increases that are based on an established value or index and that are structured to occur automatically, executive review and approval at the time of the increase is still commonly required. Many agencies are also required to have public hearings to provide an opportunity for public input in the setting of toll rates and subsequent increases.

For agencies that utilize AET instead of cash collection, toll rate increases usually occur annually. Without the burden associated with handling coins and processing change in the lanes, the annual toll rate increases for AET facilities are generally small percentage points (can be increments based on pennies); whereas toll rate increases for cash collection operations generally occur every few years and are larger, with increments based on nickels, dimes or quarters.

2.4.5 Managed Lanes

The FHWA defines "managed lanes" as highway facilities, or a set of lanes within a facility, where operational strategies are proactively implemented and managed in response to changing conditions. Managed lanes are typically a "freeway-within-a-freeway" where a set of lanes within the freeway cross section are separated from the general-purpose lanes.

The various lane management strategies being used are categorized as follows:

Lane Management Strategies

- **ACCESS**
  Lane management is accomplished through the use of access control where all vehicles are allowed in the lane(s) but the number of ingress and egress points to and from the lane(s) is minimal.

- **ELIGIBILITY**
  Lane management is accomplished by only allowing certain vehicles (e.g., express buses) and/or vehicles meeting certain occupancy requirements (e.g., two or more occupants) to use the lane(s). These lanes are commonly referred to as express bus-only lanes and/or high-occupancy vehicle (HOV) Lanes.

- **PRICING**
  Lane management is accomplished through the use of congestion pricing and offers drivers the option to pay a toll for using a less congested lane. Since these lanes are typically adjacent to free (but congested during peak travel times) lanes, they are referred to as express lanes. Also, the pricing structure for these types of lanes often include a discount, or even free passage, for an HOV and if so, are referred to as high-occupancy toll (HOT) express lanes, or simply HOT lanes.

The concept of priced managed lanes (i.e., express lanes), is emerging as a way to address gridlock in urban regions across the country. The congestion pricing used with these types of lanes helps control the number of vehicles in a given lane and guarantees customers a more reliable trip time.

In 1995, California's 91 Express became the first priced managed lanes in the country. Today, more than 15 metro areas have implemented 28 priced managed lane projects, and 12 cities are developing 30 more corridors. State DOTs, such as the Florida Department of Transportation, are now working to create seamless, interconnected networks that will further expand drivers' mobility options.

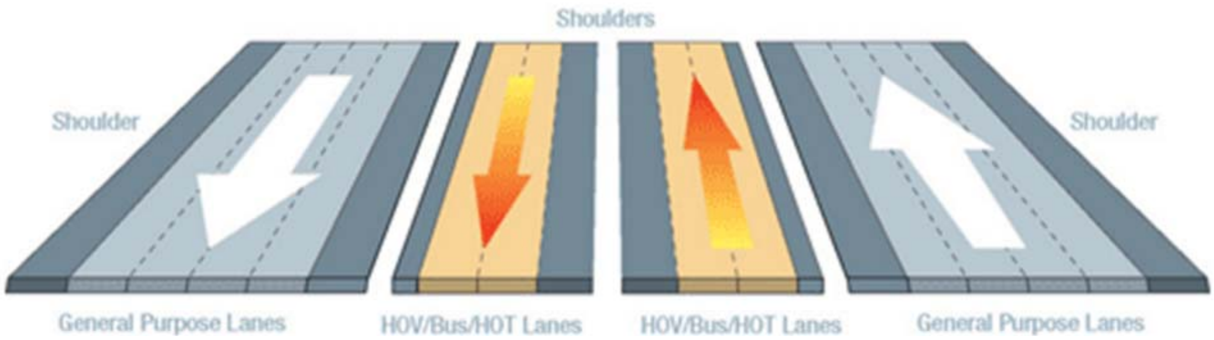


Figure 2-3: Managed Lanes (Transurban)

2.5 Utilization of Consultants

Toll authorities divide their work among in-house staff and external consultants in accordance with individual capabilities, business needs and financing requirements. Several agencies retain large staffs that oversee a variety of functions from roadway design to customer service to toll enforcement. Many choose to outsource nearly all of these functions to consultants. Most toll agencies use the services of a general engineering consultant (GEC) and a traffic and revenue (T&R) consultant. These consultants play such an important role in helping sell toll-backed debt that rating agencies and other capital market participants demand these services be performed by qualified experts from an independent third party.

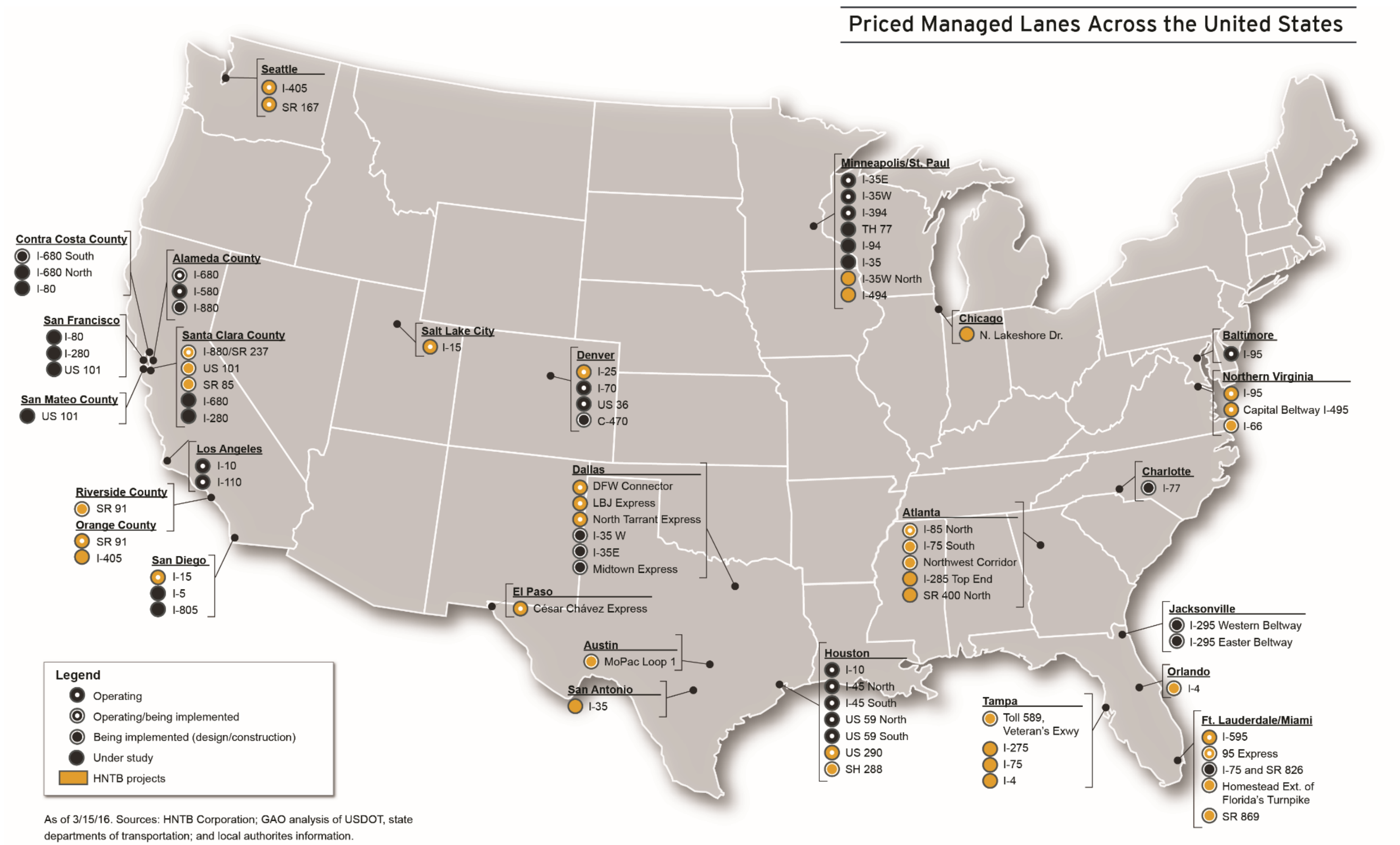


Figure 2-4: Priced Managed Lanes across the United States

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3. TYPICAL DESIGNS AND TECHNOLOGIES

3.1 Tolling Locations and Payment Zones

The determination of the tolling locations where vehicles are detected and resulting toll transactions are created is primarily dictated by the facility type, the location of the facility's ingress and egress points, and cost/benefit considerations (i.e., "optimization"). Although this general location determination is necessary and adequate for feasibility purposes, the final tolling location may be adjusted during a project's design phase based on physical characteristics of the facility such as elevated roadway structures and roadway curvatures.

As depicted in the stick diagrams below (see ***Figure 3-1***), the combination of facility type and the location of ingress/egress points (whether the access is to/from intersecting roadways or, in the case of Managed Lanes, to/from the adjacent general purpose lanes) directly impacts the toll payment zone locations.

On a ticket system facility where each vehicle is charged a toll amount based on the distance the vehicle travels, toll payment zones are located at or near each entrance and exit point. This concept allows each vehicle to be appropriately charged based on their trip and eliminates non-tolled trips (i.e., no "free movements") on the facility.

On a barrier system facility where each vehicle is typically charged a toll amount for each segment traveled, toll payment zones are usually located on the mainline travel lanes. This concept allows each vehicle to be appropriately charged based on their trip; however, if the trip includes multiple segments, multiple corresponding toll transactions are typically created. Although this concept can result in free movements if a vehicle does not cross a barrier, the locations can be "optimized" to capture critical movements by including a combination of mainline and ramp toll payment zones in a manner that balances cost (of installation, operations and maintenance [O&M]) against revenue (see ***Figure 3-2***). The mainline toll payment zones are typically a multiple-lane (plus shoulders) design which includes overhead gantry structures that can span either a single direction of travel or both directions of travel.

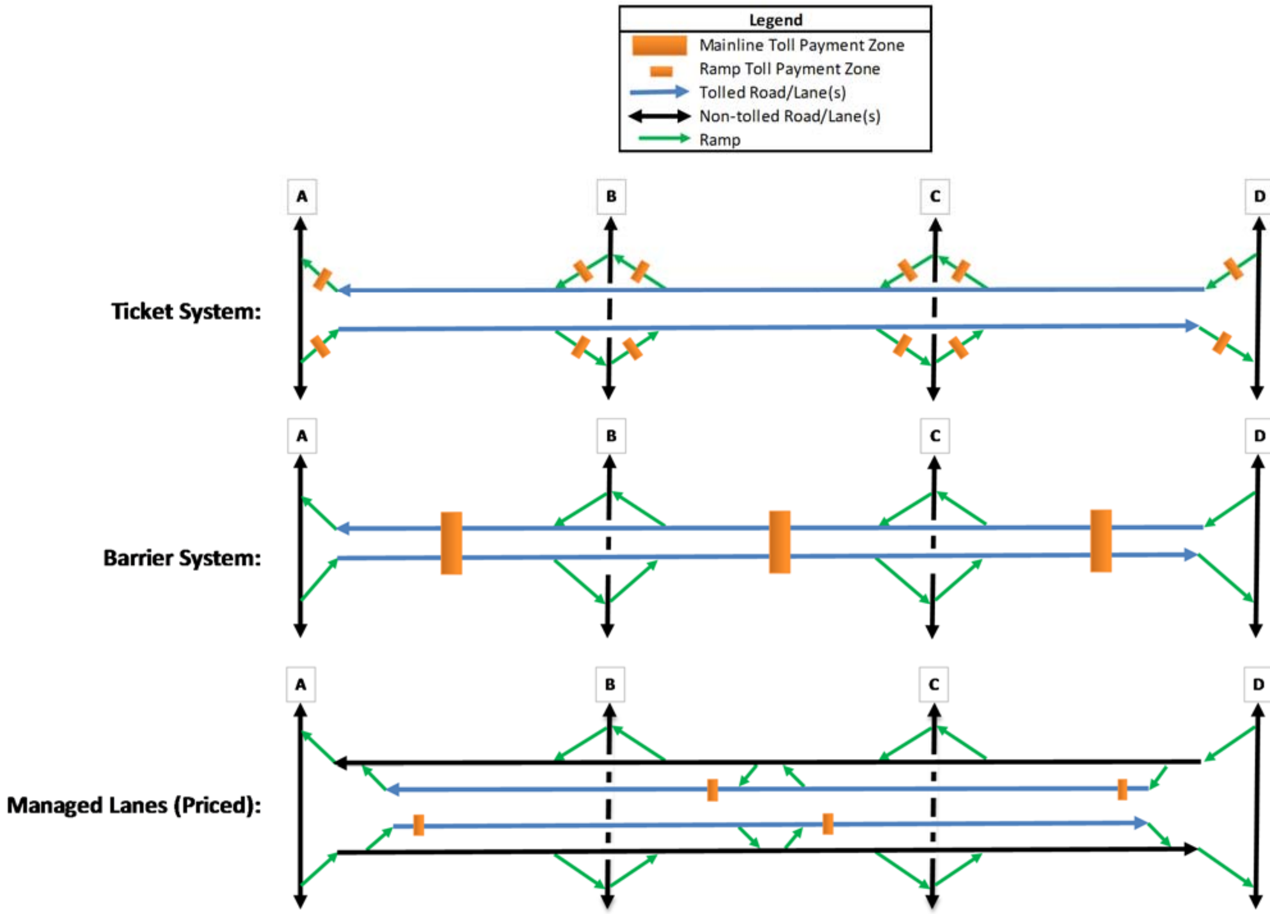


Figure 3-1: Toll Facilities and Payment Zones

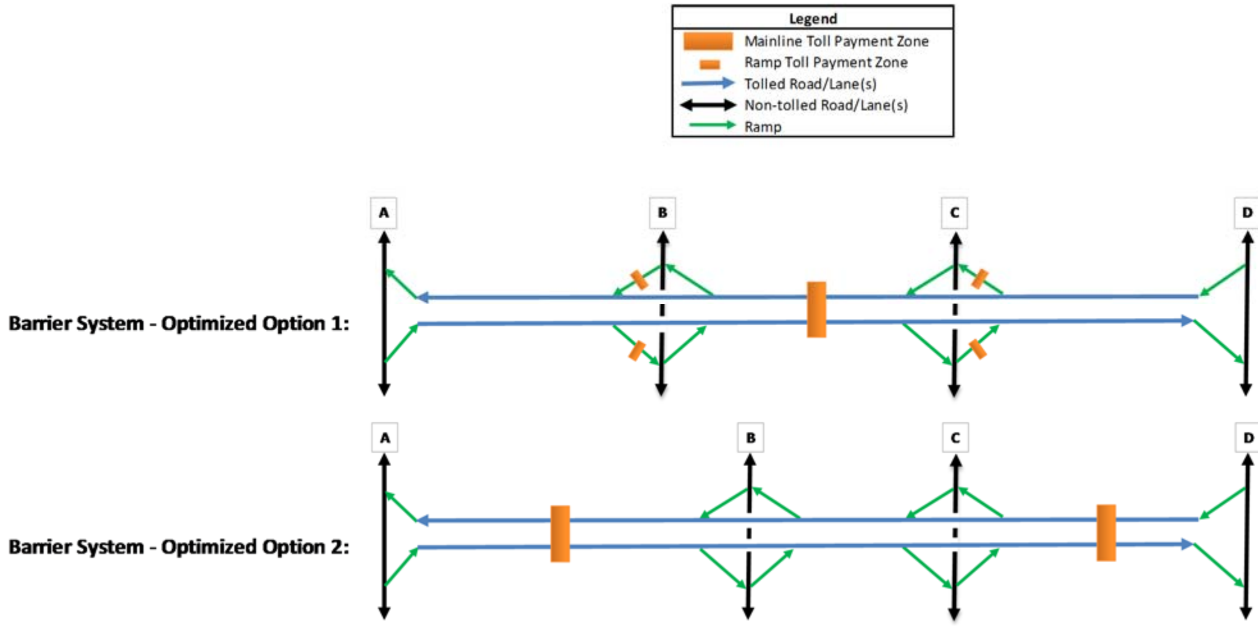


Figure 3-2: Toll Payment Zones on Optimized Barrier Systems

3.2 Tolling Technology

The evolution in toll collection methods from cash-based tolling to ETC, ORT and AET has been accompanied by an evolution and shift in the technology used to collect tolls. Toll authorities today use devices such as cameras, antennae, readers and loops that feed information to computers running sophisticated software and algorithms to detect, classify and record vehicles.

As seen with technological devices throughout all types of industries, the trend today is that these devices are becoming smaller in terms of size, faster in terms of processing speed, more robust and efficient in terms of processing power, and more sophisticated in terms of functionality. This continuing trend will benefit both tolling authorities and drivers. As the tolling technology advances, increased functionality will make detecting, classifying and recording of vehicles (including image capture and processing) faster and more accurate, which will ultimately make the collection of tolls easier and more efficient. Technological advances are also making toll collection more cost effective. As both the capital costs of tolling technology and the related maintenance and operations costs are reduced, the feasibility of toll projects is increased.

An example of technology advances that will have an impact to tolling is Autonomous Vehicles and Connected Vehicles (AV/CV). AV/CV are currently operating on roadways in the United States.

Autonomous vehicles have a self-driving mechanism. Connected vehicles are able to send and receive signals to and from other vehicles and technology on the roadway itself. While there are only a limited number of AV/CV commercially available at this time, industry experts anticipate they will soon become a significantly larger part of the overall automotive fleet. These vehicles enhance the overall driving experience and can dramatically increase safety for motorists and pedestrians on the road system.

The ultimate impact of AV/CV is a subject of great debate. Many experts contend that as AV/CV become more prevalent, the total number of vehicles miles travelled in the United States will increase as drivers find the activity more pleasant with the vehicle doing some or all of the work, but others strongly disagree with this view. Personal ownership of vehicles is also likely to be impacted as some contend that commercial fleets and self-driving pods of vehicles will play a larger role in transporting people and goods. As ownership of vehicles becomes more centralized, it is reasonable to expect that fleet owners will demand greater improvements in vehicle fuel efficiency, which will put further downward pressure on traditional motor fuel tax revenues.

In the tolling industry, technology is driving change as technological advancements make collection of tolls dramatically more efficient and increase the likelihood that tolling can significantly supplement or replace motor fuel taxes as a viable and sustainable source of surface transportation funding. The same is true in the realm of AV/CV, where technological improvements combined with ride sharing technologies make a future of large commercial fleets dominating individual car ownership more and more likely.

Since the technology driving AV/CV is advancing so rapidly, it will be difficult for policy makers, regulators, and legislators to keep pace. Attempting to predict the way in which these technologies will evolve is difficult if not impossible. It will be important, however, for tolling and transportation officials to monitor these technological advancements and consider how they will impact operations in the future. Since tolling and AV/CV are both technology driven, the ability to capture revenue for transportation purposes via user fees should be compatible.

The sections below discuss commonly used technological components of modern toll collection systems.

3.2.1 Gantries

Toll Gantry

A gantry is an overhead structure spanning a roadway, traditionally used to display road signs over travel lanes. There are many variations of tolling gantries across the United States, but all serve the same purpose. On a toll road, gantries are used to hang the equipment necessary to collect tolls. ***Figure 3-3*** shows a typical toll gantry setup with equipment used in ORT.

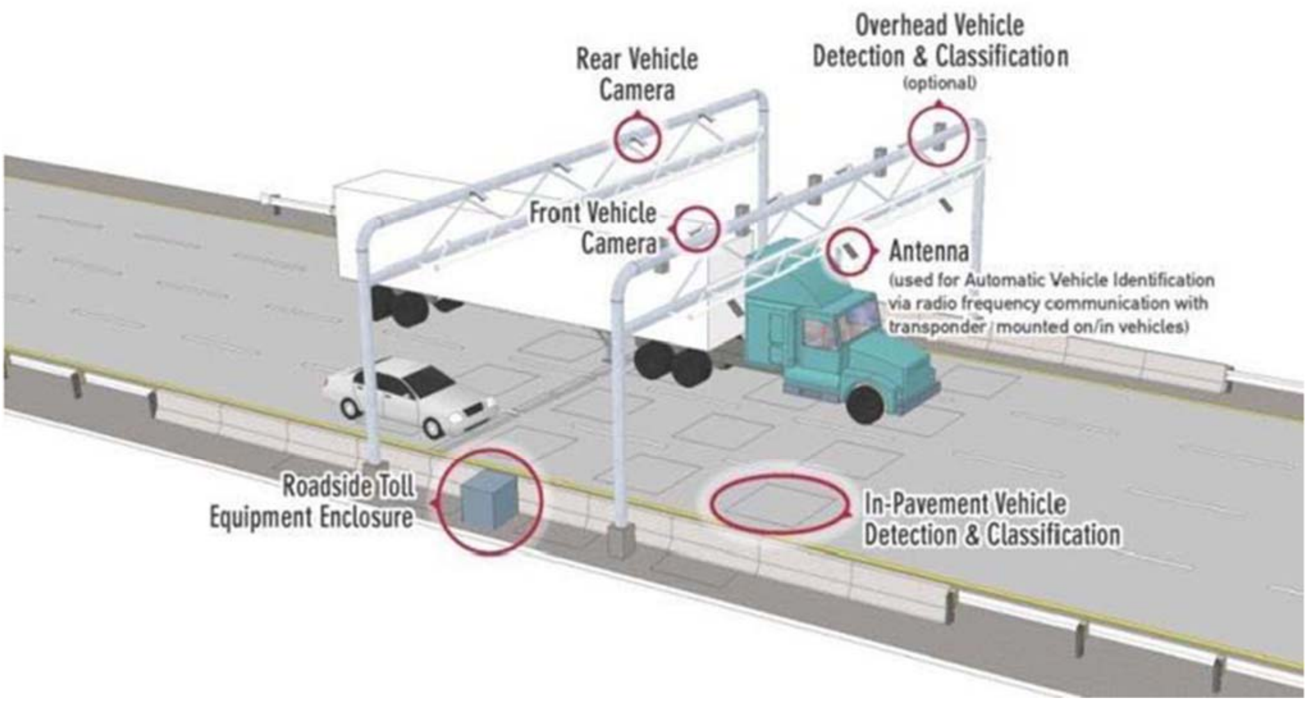


Figure 3-3: Typical Toll Gantry Setup

3.2.2 Cameras

In both AET and ORT environments, cameras are mounted over each travel lane and shoulder. Cameras can be set up to capture both the front and back license plates of a vehicle passing under the toll gantry. In ORT environments, cameras are used to capture the license plate of toll violators that do not have a transponder and for audit purposes. AET environments also use cameras to capture images of license plates, but unlike ORT, these images are used to bill the registered owner of the vehicle passing through the tolling point.

3.2.3 Automatic Vehicle Identification (AVI)

In an ETC environment (including ORT and AET), each vehicle has a transponder mounted somewhere in or on the vehicle (typically the windshield or front license plate mounting bracket). An antenna is mounted over each lane to capture the signal from the vehicle's transponder. After a transponder's signal is read, the information is sent to the lane controller and forwarded to the BOS.

3.2.4 Vehicle Detection and Classification

A series of in-pavement inductive loops are used to detect and classify vehicles in each lane. When a vehicle passes over these loops, the loops will provide the classification information to the lane controller. ***Figure 3-4*** shows a typical layout of the loops. Loops in each lane are used to give an accurate axle count of the vehicle which helps to determine a rate for which the customer is charged.

At some locations an overhead or side-fired laser-based detection system is used, along with a classification device, to detect, separate and classify vehicles. This system has the ability to distinguish between tailgating vehicles and vehicles towing trailers, and vehicles that are passing or straddling lane lines through the tolling zone. Information is sent to the lane control system to accurately classify vehicles passing through the toll gantries.

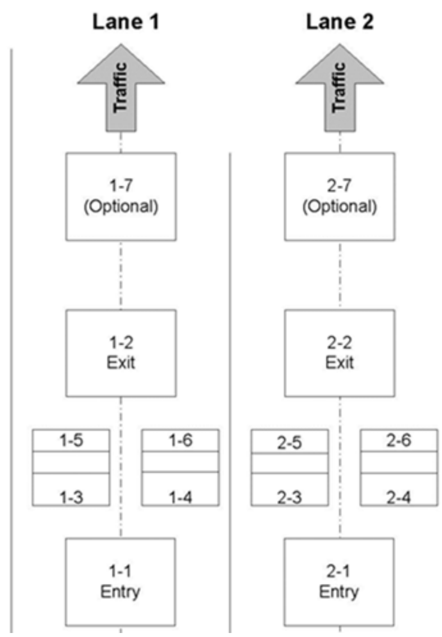


Figure 3-4: SmartToll 2-Lane Uni-Directional Tolling Layout

3.2.5 Lane Controllers

The lane controller is responsible for collecting and compiling all information from the cameras, detectors and sensors. The controller uses this information to make simple decisions such as raising the toll gate, determining if the vehicle is a violator, or activating driver feedback for a paid toll. Information for each vehicle, including transponder number, license plate images and axle information, is sent to the BOS for processing and payment.

3.2.6 Traffic Management Devices and Systems

Bluetooth™ Vehicle Sensor

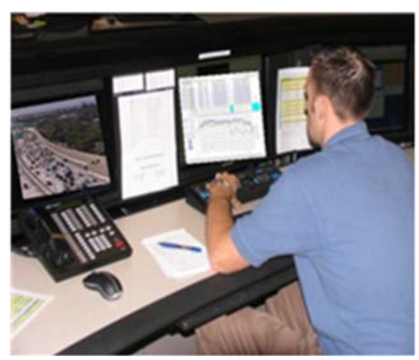
Traffic management devices in use today on tolled facilities include both conventional in-pavement inductive loops and modern roadside-located vehicle sensors that are technology-based. These technologies include Bluetooth™, radar and microwave. Traffic management devices are used individually to measure traffic conditions at specific locations on a facility. Depending on the technology and integration of these devices into a traffic management system, measurements and resulting determinations reported could include instantaneous and average vehicle speeds, lane occupancy, traffic volumes and level of service (LOS).

LOS refers to an overall rating of traffic conditions. Industry standards for a highway LOS rating system assign a letter grade (A-F) to the traffic condition, with A being the best and F being the worst. The complete listing is as follows:

- A: Free flow
- B: Reasonably free flow
- C: Stable flow, at or near free flow
- D: Approaching unstable flow
- E: Unstable flow, operating at capacity
- F: Stopped or breakdown flow

Roadside-located Vehicle Sensor

In addition to vehicle sensors, a traffic management system also typically includes cameras and changeable message signs located on the facility and integrated into a staffed operations center, commonly referred to as a Traffic Management Center (TMC). In a TMC, operators monitor information presented by the system, control and monitor camera views, and control messaging to drivers primarily for the purpose of effectively and safely managing traffic and responding to incidences.



TMC Operator

3.2.7 Multiprotocol Readers

The technology available in transponder readers on the market today has advanced to the point that an individual reader is not only able to be configured to communicate using different protocols but it is also able to use the different protocols essentially simultaneously. Numerous toll agencies in the US have implemented and configured their readers to operate in a dual-protocol mode where the readers are communicating with vehicle transponders using two different protocols (see ***Figure 3-5***). In addition, some agencies have successfully recently tested readers set to operate in a tri-protocol mode where the reader is communicating with vehicle transponders using three different protocols. Whether dual-protocol or tri-protocol, this multiprotocol functionality provides toll agencies with the possibility of migrating to different protocol transponders and/or eventually, national interoperability.

Some examples and manufacturer specifications of multiprotocol readers available on the market today include:

- Encompass® 6 (manufactured by TransCore)
  - 915 MHz multiprotocol reader
  - Supported protocols include ATA, Title-21, IAG and 6B
  - Able to buffer 500,000 transactions

- JANUS® (manufactured by Kapsch/MARK IV IVHS)
  - 915 MHz multiprotocol reader
  - Supported protocols include ATA, IAG/TDM, 6B and 6C
  - Able to buffer 400,000 transactions

- IDentity 6204® (manufactured by 3M/Sirit)
  - 915 MHz multiprotocol reader
  - Supported protocols include ATA, Title-21, 6B and 6C

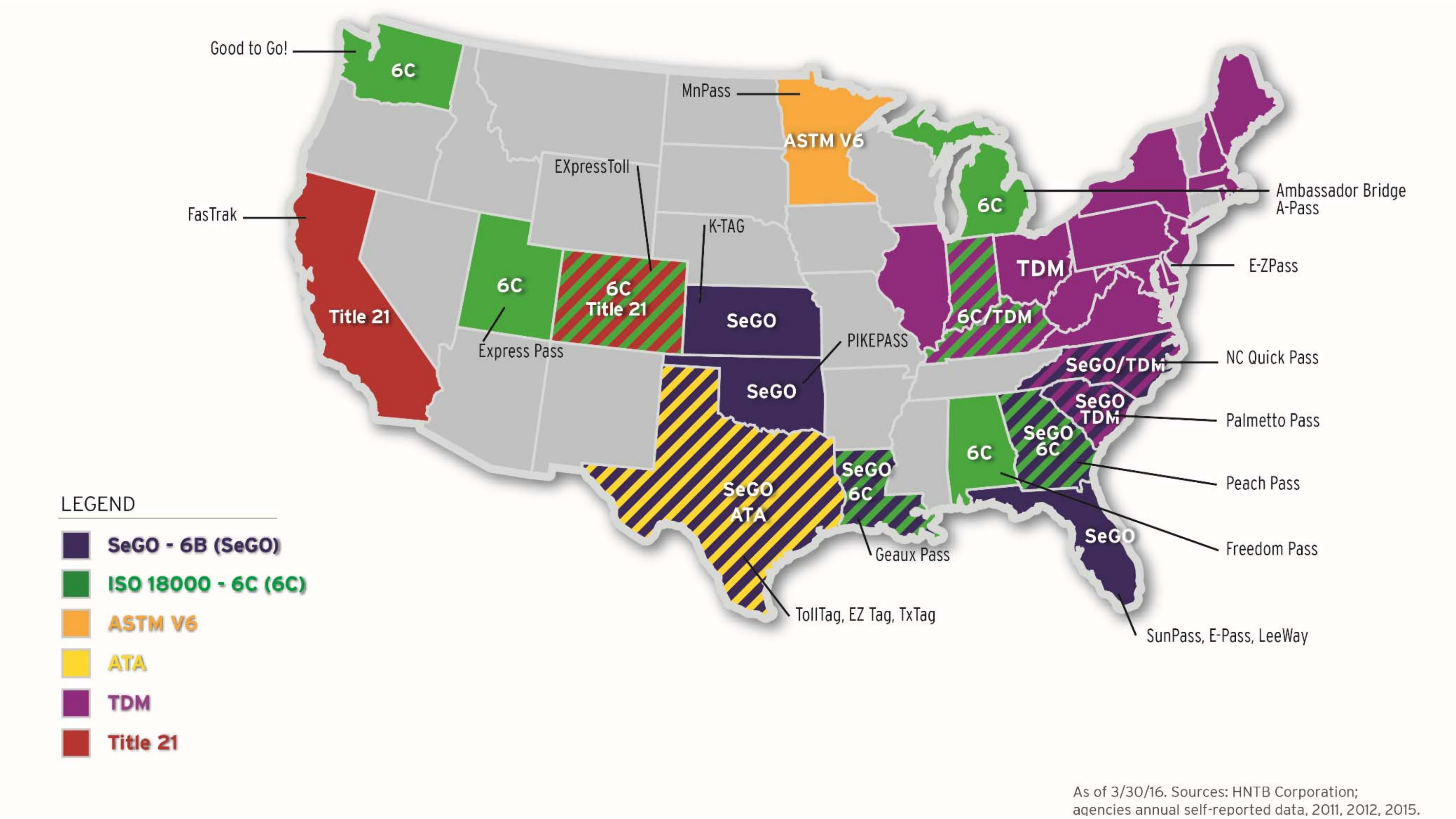
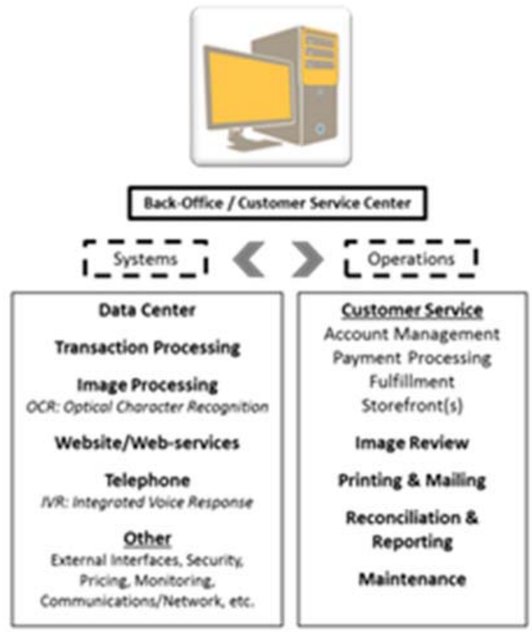


Figure 3-5: U.S. Transponder Communication Protocols

3.2.8 Back-Office Systems

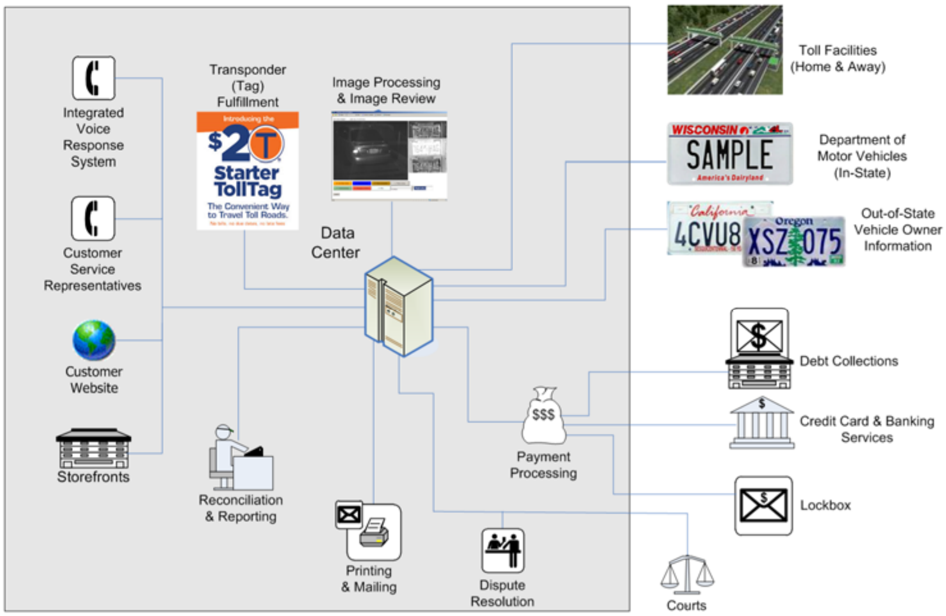
The integrated technologies of BOSs complement the functionality of roadside devices, and are equally important to the efficient and successful operation of a toll facility's modern ETC system. BOSs and their technologies are centered on a state-of-the-art data center that performs a variety of functions that could include:



BOS/CSC Systems and Operations

- Receiving and processing toll transaction information and images
- Managing customer accounts
- Managing billing and payment processes
- Interacting and interfacing with customers through the following:
  - Call center staffed by customer service representatives (CSRs)
  - Walk-in storefronts staffed by CSRs
  - Self-service integrated voice response (IVR) subsystem
  - Self-service website
  - Mobile/smart-phone application
- Fulfilling customer orders and managing transponder inventory
- Printing and mailing correspondence
- Reporting
- Interfacing to external systems related to:
  - Interoperability
  - Credit card services
  - Banking services
  - Vehicle owner information
  - Lockbox services
  - Debt collection services
  - Courts

The following diagram provides an overview of the BOS and its typical functions:



Back-Office System Overview

Two of the primary factors that drive the size of a back-office system and operation are the volume of toll transactions and the quantity of customers the BOS handles. A larger volume of toll transactions translates to a larger and more powerful system for receiving, processing and storing the toll transaction information, including license plate images. A larger quantity of customers also translates to a larger and more powerful system for managing customers and customer accounts, including billing and payment processing. Operationally, a larger volume of images to process translates to more staff needed to perform the image review and a larger quantity of customers translates to more staff needed to support customer interfacing and handle customer interactions.

The system and staffing size of a back-office operation can vary greatly from agency to agency. Operational characteristics determined by an agency's tolling policies and business rules, such as hours of operations, payment methods, and transponder costs, can have an impact. Additionally, customer behavior, especially in the form of frequency of travel and transponder usage rates (commonly referred to as ETC penetration rates) can also have a significant impact. Also, it is common for a new toll agency, or for an existing toll agency implementing a new toll facility, to have start-up activities for the first several months that include transponder sales and account set-up efforts which would initially impact operations but would eventually decline into a steady-state condition.

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4. FEASIBILITY STUDIES AND FINANCING

4.1 Overview of Toll Feasibility Analysis

Toll project development requires a robust evaluation of project revenues, costs and financing potential. A toll facility is typically expected to fund its ongoing roadway and tolling O&M expenses, as well as contribute to the financing of the project's upfront capital costs. A toll feasibility analysis and report is usually performed during the early planning phase of a toll project and is updated and refined as the project enters the procurement and implementation phase.

An important purpose of feasibility analysis is to help determine if the revenue potential of the project justifies the inclusion of a user-fee or if the project should be developed without tolls. A myriad of factors will ultimately determine if a project is developed with tolls. Toll feasibility analysis evaluates the full lifecycle costs of the project and the ability of toll revenues to both meet the annual cost obligations and support toll financing. Financial feasibility assessments do not have a standard methodology, and the evaluations vary considerably inside of the toll industry. The following table lists the major components of a toll feasibility analysis.

FEASIBILITY COMPONENT	DESCRIPTION
Project and Scenario Identification	• Statewide, corridor-specific or pipeline • Project limits, entry/exit points, number of lanes • Project phasing and alternatives
Capital Cost Estimate	• Project development and construction costs
Roadway O&M and R&R Cost Forecasts	• Routine operations and maintenance (O&M) • Renewal and replacement (R&R)
Tolling Capital, O&M and R&R Cost Forecasts	• Toll equipment and technology needs • O&M and replacement costs of toll equipment • Back-office and transaction costs
Traffic and Revenue (T&R) Forecast	• Toll rates and assumptions • Traffic attraction and diversion • Revenue and travel times
Financial Feasibility Assessment	• Gross and Net revenue forecast • Feasibility Index (period of net revenues divided by capital costs) • Debt capacity

Due to the complexity of toll revenue forecasting and the technology and operations associated with collecting toll revenue, expert analysis and reports are required if a toll feasibility analysis is undertaken. The basis for the tolling plan and the assumptions governing operating policies are defined in the toll feasibility report. The primary deliverables of a toll feasibility report are to evaluate (i) the gross revenue potential of a toll project, (ii) the net revenue potential of a toll project after the annual O&M/R&R costs are deducted, and (iii) any financing proceeds that can be delivered through toll revenue debt. Since toll facilities are implemented to solve a transportation need, the traffic and revenue (T&R) analysis will also address any congestion relief, travel time savings or reliability, and the impact on the broader transportation network.

Toll feasibility analysis has various levels of sophistication dependent upon the level of planning and engineering the project team has conducted and the level of confidence expected in the proposed results. Toll feasibility analysis is a very useful tool in identifying the forecasted operational and revenue characteristics of a facility, but several other factors must be weighed in evaluating the results of a feasibility report. Because a feasibility analysis is based on assumptions and includes long-range forecasts, the results are limited by the accuracy of the inputs and future conditions. The following factors should be considered in concert with the analysis:

- Level of Sophistication – feasibility analysis can be performed on a high level before preliminary engineering or environmental clearance is conducted and is continually refined under project letting
- Project Definition and Scope – the feasibility analysis and results change as the project and assumptions evolve
- Economic Environment – traffic, revenue and cost inflation will be dictated by the local, regional and national economy; and bidding environment
- Gap Funding – a variety of options are available to supplement toll revenue funding and financing to complete a project's funding package
- Financial Market Conditions – assessment of debt capacity is subject to future market conditions
- Political Support and Involvement – changes in project scope, policies and procedures, and schedule will impact feasibility results
- Accuracy of Forecasts – predicting revenues and costs over a 30-50-year timeframe are extremely challenging and governed by a myriad of factors

A robust feasibility analysis will typically culminate with a report that covers the main components of feasibility. The report will inform the reader of the project, provide revenue and cost forecasts, and summarize the financial feasibility.

4.2 Project and Scenario Development

4.2.1 Project Identification

While toll facilities vary significantly from project to project, successful toll projects all meet the same basic transportation criteria. Toll projects must have a suitable amount of traffic to justify toll implementation and solve at least one major transportation need. Toll projects can decrease congestion, produce travel time savings, provide a more reliable trip time, provide a new transportation link, improve overall throughput by partnering with other transportation modes, and even alter driver behavior. The new and dedicated revenue stream of a toll facility can also jumpstart projects that have been stalled because of a lack of traditional funding.

Projects can be selected for toll evaluation for a variety of reasons. The selection process can be part of a rigorous evaluation of all proposed projects or can be selected on a "one-off" basis. The following three categories summarize the main ways in which toll projects are selected for evaluation:

- Project Specific Pipeline – large or stalled projects need an innovative solution
- Corridor Analysis – projects along a specific corridor are evaluated
- Statewide or Regional Screening – all proposed projects are screened for toll potential

In some instances, the sheer size of the capital costs warrants the evaluation of a new revenue source because the required funding is significantly more than a region or state can handle with traditional funding. Since toll facilities are funded primarily through the direct user-fees of the beneficiaries of the new facility, tolling is often viewed as a more equitable funding stream. Some states are analyzing all new capacity projects for tolling to reduce the reliance on already constrained budgets and long-term plans.

4.2.2 Project Definition and Alternatives

Once a project is identified for tolling analysis, the project will typically undergo multiple iterations over the evaluation period. Since users are being required to pay a fee for using the facility, significant consideration must be given to the operational performance and tolling plan. Many toll facilities are limited access facilities, so extensive analysis is required to evaluate the number of lanes, entry/exit points, toll rates, tolling locations and traffic capture/diversion.

Since each toll scenario will produce a unique revenue stream, the goals and objectives of the project must be measured against the resulting revenue stream's ability to fund ongoing O&M costs and support toll financing. Tolling analysis usually requires multiple iterations to balance revenue generation goals with traffic throughput and financial feasibility. The analysis also typically identifies project phasing and alternatives based on the viability of each scenario to achieve full funding.

4.3 Roadway Capital Costs Estimates

Developing reasonable and accurate capital costs estimates is fundamental to project success. Without a clear picture of project costs, it is difficult to evaluate the availability of funding. Developing these estimates requires sufficient definition of the project's scope, termini and timeline. Often, construction schedules will vary based on the project delivery model. If assumptions are made regarding project delivery, those assumptions should be revalidated if the delivery model changes. Multiple estimates can be developed for "what if" analysis, but it is important to establish the critical aspects for each scenario (e.g., project limits, construction schedule, etc.). This type of analysis can be useful in determining and optimizing project parameters early in the development stage and preventing scope creep downstream.

Capital cost estimates are performed at varying degrees of detail and become more precise as the project advances through development. Earlier planning level estimates may be based on new lane mileage multiplied by some historical average cost per mile. More refined estimates are typically based on projected unit costs based on a more refined scope. Research on cost over-runs for transportation projects has found that using a probabilistic cost estimation model in conjunction with a detailed risk assessment improves the estimate.[8] Using this technique, capital costs are estimated such that expenditures will not exceed thresholds within a given level of probability. As more information becomes available and risks do not materialize or are mitigated, the probability bands narrow and the agency can take greater confidence in an increasingly precise estimate. Detailed guidance on capital cost estimation procedures is available from the American Association of State Highway and Transportation Officials (AASHTO), the National Cooperative Highway Research Program (NCHRP) and the U.S. Government Accountability Office (GAO).[9]

The results of the capital cost forecasts are to establish the pre-construction (environmental, ROW, utilities and engineering) and construction costs of the project. The forecast is accompanied with a project schedule that states when the costs will be incurred. Capital costs are typically inflated to the year of expenditure and set both the pay-as-you-go and debt funding requirements.

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[8] Page 81 of Managing Capital Costs of Major Federally Funded Public Transportation Projects http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_w31.pdf

[9] https://www.fhwa.dot.gov/ipd/project_delivery/resources/cost_estimating/

4.4 Roadway O&M and R&R Costs Estimates

The process for estimating expenses for roadway O&M and R&R is similar to the process for estimating capital construction costs. Since toll revenues are typically expected to cover their own annual roadway and tolling O&M costs, a forecast of roadway lifecycle costs is included in the feasibility analysis. Roadway O&M and R&R expenditures must be sufficient to preserve or improve pavement smoothness and other road conditions to levels that meet customer expectations.

The methodologies available for estimating roadway O&M expenses vary, but the most common method involves estimating costs per mile based on the expected degradation desired level of service. Detailed methodologies for estimating O&M costs are available from the NCHRP[10] and several other academic sources.[11]

The major types of activities of O&M forecasts include, but are not limited to the following:

- Routine roadway repairs (pothole patching, guard rail replacement, etc.)
- Inspections (bridge, sign structures, signs, traffic signals, etc.)
- Routine bridge repairs (spall removals, railing repairs, etc.)
- Cleaning bridges, curbs, gutters, medians, etc.
- Cleaning and repairing drainage structures and ditches
- Lighting maintenance (poles, lights, conduits, wiring, etc.)
- Litter patrol and pickup
- Graffiti removal
- Care of shrubs, plants, trees
- Mowing, seeding, sodding and fertilizing
- Pre-treating for snow, ice and plowing
- Enforcement Patrol
- Traffic detours
- Incident response

[10] http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_688.pdf

[11] https://minds.wisconsin.edu/handle/1793/54136

The results of the O&M and R&R analysis are two annual forecasts for each component. These costs are compared to the toll revenue forecast to evaluate the project's net revenue potential.

4.5 Tolling Capital and O&M Costs Estimates

Like roadway O&M costs, tolling capital costs and O&M costs are also forecasted for the project. The first step in developing preliminary estimates for the tolling components is to create a preliminary tolling plan. This can be developed for individual projects or for a tolling system as a whole. The tolling plan starts as a simple list of assumptions about how the toll facility will operate. These assumptions will inform the eventual development of a final concept of operations document that details the specifics of tolling in significant detail. Preliminary feasibility studies will only include high level tolling assumptions while more sophisticated studies conducted just before implementation will have detailed cost forecasts for all tolling elements and policies.

To develop defensible tolling O&M estimates, the tolling plan must, at a minimum, establish how tolling will operate at a high level. Basic information regarding the methodology for vehicle identification and classification, number of lanes, location of tolling zones, types of payments accepted, traffic forecast, and violation enforcement mechanism must be known or assumptions must be made to allow engineers to produce defensible estimates.

4.5.1 Tolling Capital Costs

Capital costs for the toll system include the cost for equipment and necessary infrastructure within the tolling zones. Also included are the costs of all associated systems, software and offsite components to complete a toll transaction. Maintenance costs include the annual routine maintenance of the toll system and recurring life cycle replacement costs. Operations costs include the costs to collect the tolls through offsite account management operations. For states without existing tolling operations, an offsite, back-office account management operation is typically assumed for processing the transponder and video billing transactions.

Total toll system capital costs include toll system acquisition and implementation costs. Upfront capital cost estimates typically include:

- Overhead gantry structures (one pair at each toll location)
- Transponder antennas and RF modules
- Equipment cabinets and generators

- Front and rear cameras
- Automatic vehicle classification system
- Video audit system
- Vehicle presence detectors and separators
- Host computers
- Installation and testing of all components

For AET projects, it is generally assumed that no additional ROW is needed for the toll system due to the flexibility of where toll gantries can be located between the roadway's ingress and egress points. AET locations, as opposed to cash collection locations, are essentially overhead gantries simply spanning the roadway pavement without the need for an adjacent operations building. In addition, for an AET project involving a loop-based vehicle detection and classification system which is being implemented on an existing roadway, costs may need to include replacement of existing roadway pavement depending on its existing condition and nature.

Estimating toll equipment R&R costs includes forecasting the periodic repair and replacement costs of lane hardware, BOS and the entire system.

4.5.2 Tolling O&M Costs

O&M expenditures are divided between the roadside toll collection system (RTCS) and the BOS since they are distinct systems and services. The RTCS O&M expenditures are primarily maintenance-related services including preventative, predictive and emergency repairs to roadside toll equipment. This includes active spare parts inventory management. Annual costs are allocated for these services based on the actual number of toll lanes.

The BOS is more labor intensive than the RTCS. It includes customer service representatives to answer telephone calls and communicate with customers, fulfill transponder orders, review license plate images, generate invoices, and process payments. These ongoing costs are commonly estimated based on the quantity of toll transactions processed through the BOS.

Toll transactions will either be transponder transactions or video billing transactions. Since video billing transactions are typically approximately three to six times more expensive to process than transponder transactions, it is very important to have policies and strategies in place to encourage transponder usage. Although a small portion of video billing revenue will not be collectable, the toll rate differential for image-based transactions and violation fees are usually designed to offset the revenue loss.

The BOS O&M cost estimate is typically achieved by multiplying the annual amount of transponder and video transactions by the assumed cost of each collection method. BOS cost estimates for transponder transactions range from 8 and 12 cents while video transactions are typically estimated between 40 and 80 cents per transaction. There is wide variability in reported transaction costs between toll agencies. This variability is primarily a function of differences in transaction volume and differing decisions by agencies as to which direct or indirect costs to include in the transaction cost calculation. Although the BOS costs related to transaction volumes are influenced by economies of scale that can result in a lower cost-per-transaction for a higher volume of transactions processed, agencies with higher volumes of transactions usually require larger and more costly systems and operations.

It is common for these estimates to be constructed separately for the roadside and back-office components of the tolling system. Roadside cost estimates are often driven by the of number of lanes, and the number and types of equipment needed to achieve tolling classification specifications such as loops, lasers, fiber optic treadles, antennae, etc. Back-office cost estimates are more often a function of resources needed to review license plate images and respond to customer calls and requests, although there are operational costs for maintaining and licensing computer hardware and software. In instances where a new project is being added to an existing network of toll projects, the back-office estimate is usually the marginal cost associated with adding the additional transaction load to the existing back-office burden.

4.6 Traffic and Revenue Forecast

Traffic and revenue (T&R) studies are used to forecast traffic on toll facilities under various toll rate structures and macroeconomic scenarios. T&R studies are important in determining how to structure toll rates and in evaluating the feasibility of potential projects. T&R forecasting involves subjective estimates of the future behavior of people and businesses with respect to housing and business location decisions and choices of transportation. There is tremendous uncertainty associated with these forecasts, and a good study will be transparent about pointing out the uncertainties.

Traffic demand risk can vary significantly based on whether the proposed project is a new construction project (i.e., a greenfield project), an expansion of an existing facility, a conversion of an existing facility to a tolled facility, or an existing toll facility with a proven history of traffic demand.

Quantitative modeling is used to synthesize the project inputs and assumptions into a forecast of tolled traffic and revenues. These models can be simple spreadsheet models for sketch level analysis or complex models for Investment Grade forecasts. T&R analysis typically incorporates the travel demand models that are maintained by state or local planning agencies to aid in transportation planning and organize the decisions involved with making a trip into four primary decision points: trip generation, trip distribution, mode/occupancy choice and route assignment. Sophisticated T&R analysis typically utilizes a proprietary model with a toll diversion component to assess how traffic patterns change when a new tolled facility is introduced into a transportation network.

There are several key considerations to understand when evaluating the results of gross revenue projections. The willingness of travelers to embrace toll roads and the values of time for those travelers is subject to significant variation. The future growth of population and employment within various regions of a study area are also key assumptions, which heavily influence estimated revenue. As a portion of travel is discretionary in nature, the willingness to travel is also influenced by income growth and cost of fuel, both of which are subject to significant variation over time. Net revenue is significantly influenced by the ability to collect 'post-pay' transactions, such as those generated by video billing.

T&R analysis has various levels of complexity and sophistication dependent upon the level of effort, available data, modeling complexity and intended use of the forecast. The tolling industry typically defines expert T&R analysis based on three levels. The first level simply tries to assess if a project has the potential to generate toll revenue while the third level is required if an entity wants to sell investment grade debt. ***Table 4-1*** illustrates the three levels of T&R analysis.

Table 4-1: Levels of T&R Analysis

PHASE	OBJECTIVE	INFORMATION	TIME	CERTAINTY
I	Screening test, Revenue Potential, Identify Alternatives	Secondary sources: available data, screenline analysis, field reconnaissance, model outputs	1 to 3 months	General level of traffic and revenue
II	More rigorous feasibility, select alternative for full study	All of the above; collect new data, independent forecasts, use are models	3 to 6 months	Refined toll scheme, greater confidence, certain elements accepted
III	Investment Grade Forecast; Finance and Construct	Adapt area models to reflect future network and independent socio-economic forecasts; test sensitivity	6 to 12 months	Comprehensive; can stand scrutiny of Financial Community

Source: Stantec

A Level 1 T&R forecast is based on a concept plan that provides a generalized description of a potential project in terms of its configuration and assumed tolling policy. Since the project is still in a conceptual stage, existing data and assumptions based on professional judgment are used to generate the traffic and revenue forecasts. Typically Level 1 forecasts serve as a screening mechanism, providing an order-of-magnitude revenue stream that can be used to assess if the project should be advanced to more detailed analysis.

Level 2 T&R forecasts are developed in coordination with additional design studies that further define the project's alignment as well as planned interchanges. These forecasts are developed with travel demand models and additional data is gathered specifically for the proposed facility. The proposed facility could still include several alternative alignment options and various tolling plans that are being considered by decision makers. With a more refined project, the T&R forecasts provide a more detailed assessment of revenue potential as well as estimates of transactions that influence O&M costs for the toll facility. Refined design plans are used to prepare more detailed cost estimates, which together with the revenue stream and a financing analysis, provide a more comprehensive assessment of overall feasibility.

Once a final decision is made to advance a project with debt financing, a Level 3 (Investment Grade) T&R forecast is prepared. At this stage a final project alignment and any construction phasing has been developed, along with a final toll collection plan and associated policies for various payment methods. A detailed assessment of all key variables influencing the T&R forecast is performed. This includes an independent review of future population and employment forecasts and an assessment of timing and likelihood of potential improvements in the transportation networks that compete with or support the proposed toll facility. Additional survey data and extensive traffic counts are used to verify existing travel patterns in the project corridor. The T&R forecasts are subjected to extensive sensitivity analysis to provide an indication of variations in the revenue estimates that could occur under differing assumptions. All of these refinements to the forecasts and the sensitivity provide a level of detail sufficient for rating agencies to generate opinions of overall viability of the assumed revenue stream. The revenue stream, together with final construction costs and O&M costs are used to develop a final financing plan, which is then submitted to rating agencies for evaluation and designation of a rating for financing.

As the sophistication of a T&R increases, several tools are utilized to help assess the project and the behavior and willingness of users to pay a toll. These tools are sometimes conducted in a Level 2 analysis but are standard components in a Level 3 investment grade analysis. The components are as follows:

- Stated Preference Survey – A survey of potential users of a tolled facility to assess willingness to pay and value of time in a project's geographic area

- Origin and Destination Study – A study of the travel patterns of actual users of the corridor
- Economic Report – A detailed report of the population, demographics, income and growth rates of citizens and businesses in the toll facility's region

There are many revenue drivers and assumptions of a T&R study that affect the results of the analysis. The T&R process will evaluate and assign a value to these items based on the projected users of the facility. The following items represent several of the key factors:

- Modeling Data and Assumptions – Defines the level of effort, available data and broad project assumptions
- Travel Demand Data – Defines the source and type of travel demand data and the use of socioeconomic data including population and employment data and relevant growth rates
- Value of Time (VOT) – Used to understand an individual's willingness to pay a toll and the individual's value of time
- Travel Time Data – Collected to assess current travel conditions along the corridor and competing corridors
- Toll Rate Regime – Defines the toll rates and classifications used in the analysis
- Annualization Factor – Converts a typical weekday of traffic into an annual value
- Ramp-up Schedule – Adjusts the first few years of revenue after opening downward while the full benefits of the toll road are realized by the users

The outputs of T&R analysis typically include revenue and transactions tables as well as a report narrative which summarizes the analysis, assumptions and results. The analysis can also contain sensitivities that test certain underlying tolling assumptions or socioeconomic assumptions and produces new forecasts. The results of the T&R analysis produce an annual gross revenue forecast. This gross revenue forecast can be compared with roadway and tolling O&M costs to develop a net revenue forecast. The net revenues of a project are the primary driver of a facility's viability as a toll road and are the major inputs into a financial evaluation of toll revenue debt capacity.

4.7 Financial Feasibility

4.7.1 Feasibility Assessments

Financial feasibility is an assessment of the ability of a toll project to generate revenue to cover its own costs of operation and to assess its ability to fund all or a portion of any capital costs through a toll financing. A financial feasibility assessment is the final piece of the feasibility process and integrates the cost and revenue forecasts developed in the other components of the analysis to act as inputs in the financial assessment.

Financial feasibility analysis has various levels of sophistication dependent upon the detail of the cost and revenue analysis and the desired level of financial analysis. Toll revenues are typically used to fund a portion of the project's capital costs in addition to the operations, but they can also be used exclusively to generate annual Pay-As-You-Go (PAYGO) funding if the project does not have an upfront funding obligation. Financial feasibility assessments do not have a standard methodology, and the evaluations vary considerably inside of the toll industry. The following table summarizes three types of analyses to evaluate financial feasibility.

Table 4-2: Levels of Financial Feasibility Evaluation

	CALCULATION	DESCRIPTION
Net Revenue	Calculate the annual net revenue forecast • Gross Revenues less Tolling O&M/R&R • Gross Revenues less Tolling and Roadway O&M/R&R	• Minimum criteria for a feasible toll road is covering the operational cost of tolling • Most toll roads also cover roadway O&M as well • Assesses the amount of positive cash flow that can be used for PAYGO or debt repayment
Feasibility Index	Calculate a Feasibility Index • Sum net revenues for a specific period (30-40 years) • Ratio of net revenues over capital costs	• A single number is generated to compare scenarios and projects • The Index weights the net revenues against the upfront capital cost to help compare projects of different sizes
Financial Feasibility Percentage	Calculate Financial Feasibility Percentage • Calculate the financing (debt) capacity of the net revenue stream • Ratio of financing capacity over capital costs	• A single number is generated to compare scenarios and projects by their ability to contribute upfront funding to its capital cost • Identifies the upfront financing capacity and any resulting "gap" that is required to fully fund the capital costs • Percentage allows for comparison across projects of different sizes

Financial feasibility can be reduced to a single number to help compare and rank projects and scenarios. At the Feasibility Index level, the number generated by dividing the net revenues over a specific period of time by the capital costs helps to quantify the revenue generating potential while weighing the upfront capital costs of the scenario. When screening multiple alternatives and scenarios, the Feasibility Index helps to quickly rank and prioritize projects against each other to help identify projects suitable for future refined screening. Higher performing projects have a greater likelihood to be able to support some portion of their capital costs with a financing. Financial feasibility is only one method used to evaluate the viability of a toll project and other qualitative factors should also be considered.

For projects with positive net cash flow (toll revenues exceed tolling O&M costs annually), a more sophisticated financial analysis can be undertaken to evaluate how much toll revenue debt could be supported by a given scenario. A financial feasibility percentage can then be calculated for each scenario by dividing the upfront financing capacity by the project's upfront capital cost to evaluate what percentage of the project's capital cost can be funded with a toll financing. For instance, a hypothetical $100 million project that can support a $75 million debt issuance based solely on toll revenues would have a 75 percent financial feasibility percentage and a funding gap of 25 percent.

The financial feasibility of a project can change dramatically based on the tolling plan and assumptions used in the analysis. Feasibility studies are often used to test multiple scenarios and sensitivities to identify the structure that best leads to implementation. The ultimate feasibility of a project is determined by the results of the final investment grade traffic and revenue report; a marketable financial transaction; and the support of additional funding sources.

4.7.2 Overview of Toll Finance

A toll revenue financing is a type of project finance that is different from typical municipal debt programs and structures that are supported by taxes. A pure project financing does not have any outside revenue or credit support and is "non-recourse" to any sponsoring public partner. The debt for a toll financing tends to be issued with a longer final maturity (up to 40 years) and is back-loaded to align the debt with the increasing projected revenue stream. The debt is sculpted to maximize the revenue forecast and provide as much upfront bond proceeds that the market will allow. A project's debt service coverage ratio (ratio of annual revenue to the annual debt service) is the primary metric used to measure the amount of debt a project can support. Since the goal of a project financing is to generate sufficient proceeds to fund a facility's development costs, they tend to be more highly leveraged and carry lower credit ratings than tax-supported programs. Start-up toll facilities are usually rated in the BBB category, which is at the bottom of the investment grade spectrum. Start-up toll roads are lower rated because they typically have construction (schedule and cost) risk, have revenue ramp-up risk and rely on forecasted cash flows.

A toll financing can be structured to pledge to bondholders all net project revenues once the O&M and R&R costs are funded or can pledge to bondholders all gross revenues that are collected. The net revenue pledge structure is truly a stand-alone (non-recourse) financing since the project must support its own costs before repaying its debt service obligations. The gross revenue pledge contains a commitment from a credit-worthy source, usually a state DOT, that it will pay the O&M and R&R costs of the facility if toll revenues are insufficient to cover debt service and O&M/R&R. Since the gross revenue pledge allows more revenue to flow to bondholders, it is able to achieve more upfront bonding capacity.

Toll projects frequently use more than one debt product. Bonds sold in the capital markets are the most common form, and a federal TIFIA loan can offer additional enhancements to a financing. A brief description of the debt products are as follows:

- Current Interest Bonds (CIBs) - CIBs are the most common form of bonds in which interest is paid semi-annually. If CIBs are used for a start-up facility which requires upfront construction, the interest during the construction period must be “capitalized” or borrowed upfront as part of the bond proceeds to bridge the period until revenues commence.
- Capital Appreciation Bonds (CABs) – CABs, also called Zeros, do not pay interest on a regular basis but rather “accrete” the interest and pay it upon maturity of the bond. For this reason, CABs are sold at a deep discount (below the traditional $100 par price) since the investor is owed principal and interest upon maturity. CABs are common in project financings to maximize the amount of debt that can be issued since revenues are constrained during the ramp-up phase but grow over time.
- The Transportation Infrastructure Finance and Innovation Act (TIFIA) – The TIFIA program enables the U.S. DOT to offer credit assistance to large projects of regional and national significance through a competitive application process. TIFIA assistance is most commonly in the form of a direct loan and offers attractive terms and flexibility to more efficiently finance projects. TIFIA credit assistance typically funds up to 33 percent of the project’s total development cost and contains a maximum term of 35 years after substantial completion. The TIFIA loan rate is fixed for the life at the 30-year Treasury SLGS rate and offers flexible repayment terms. The attractive loan rate combined with the DOT’s willingness to offer the TIFIA loan on a subordinate lien (project revenue bonds can occupy the senior lien and achieve higher ratings) provides for a greater amount of debt and upfront proceeds for a project. The federal government acts as a “patient lender” with regards to repayment terms and also allows for a deferral of interest for five years while a project matures and advances beyond the ramp-up period.

5. COMMUNICATIONS

Interacting with customers is at the core of the tolling business. Toll authorities develop comprehensive strategic communications plans to manage their communication efforts with the media and travelling public, as well as other key stakeholders.

5.1 Key Stakeholder Outreach

In the early stages of tolling implementation, it is important to collect input from and communicate with key members of the legislature, metropolitan planning organizations (MPOs), business and community leaders, and other interests in the impacted region. These stakeholders will be expected to answer questions from the general public about tolling, and they need to be well informed in order to do so.

5.2 Customer and Media Outreach

Example Outreach Message

Tolling information and customer outreach campaigns also begin early in the process, often before construction is complete. The purpose of this outreach is to familiarize the driving public with how tolling works and how it will impact their daily commute. Outreach campaigns address toll rates, location of tolling points, types of payments accepted, benefits of opening a prepaid account, and enforcement mechanisms in place for violators. Campaigns typically use multiple mass media channels including television, radio and social media. Additionally, many authorities hold a series of public meetings to allow direct interaction between customers and authority staff.

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6. CASE STUDIES

6.1 Overview

Tolling has expanded gradually since the Philadelphia and Lancaster Turnpike opened in 1792. The gradual expansion has included implementation of tolling by turnpike authorities, port authorities, regional mobility authorities, state DOTs, municipalities and other government agencies. This has resulted in differing statutory frameworks and governance structures for administering tolled systems. Differing reaction to advances in technology and changing financial climates has also contributed to this diversity.

Despite this diversity, general basic concepts appear in the statutory authority and governance structure of these entities. These basic concepts include a grant of the ability to toll, definition of the tolled system, a clearly established governance structure, requirements on how toll rates are set, authorization of bonding or other system finance, requirements for contracting, effective enforcement of toll payment, limitations on the use of data collected during an electronic toll transaction, and criteria for data retention.

This section includes case studies of the following seven different tolling authorities:

- Washington State Department of Transportation
- North Texas Tollway Authority
- North Carolina Turnpike Authority
- Florida's Turnpike Enterprise
- Minnesota Department of Transportation
- Illinois State Toll Highway Authority
- Kansas Turnpike Authority

These tolling authorities were chosen to illustrate various governance structures, best practices and tolling implementations. The case studies include information related to governance structure, description and statistics of the toll authority, legislative structure and financing.

This section also includes case studies of the following tolling authorities to illustrate alternative project delivery methods:

- Virginia Department of Transportation
- Indiana Toll Road

6.1.1 Governance Comparison

Table 6-1: Comparison of Governance Models

TOLL AGENCY	INSTITUTIONAL MODEL	GOVERNING BODY	CHIEF EXECUTIVE	HISTORY
Washington State Department of Transportation (WSDOT), Toll Division	Division of DOT	WSDOT; Washington State Legislature determines which facilities may be tolled; Toll rates set by Washington State Transportation Commission (WSTC) – seven members appointed by the governor	Secretary of Transportation / CEO; Appointed by the governor and confirmed by state legislature	Toll Division established in 2009; 14 bridges previously funded under Washington Toll Bridge Authority created in 1937
North Texas Tollway Authority (NTTA)	Regional authority; sanctioned by the State	Board of directors; Nine appointed members: two by each member county and one by the governor from an adjacent county; none may be elected officials	CEO / executive director; Selected by the board of directors	Texas Turnpike Authority (TTA) established in 1953; NTTA replaced TTA in 1997
North Carolina Turnpike Authority (NCTA)	Located inside DOT	Board of directors; Nine members: the Secretary of the North Carolina DOT (NCDOT); four appointed by the Governor; two appointed by the president pro tempore of the Senate; and two appointed by the speaker of the House of Representatives	NCDOT Secretary; Appointed by the governor	Established in 2002 as independent agency; Transferred to NCDOT in 2009

TOLL AGENCY	INSTITUTIONAL MODEL	GOVERNING BODY	CHIEF EXECUTIVE	HISTORY
Florida's Turnpike Enterprise (FTE)	Separate Business Unit of DOT	Florida DOT (FDOT)	Executive director / CEO; Selected by Secretary of Florida DOT	Florida State Turnpike Authority established in 1953; Incorporated into FDOT in 1969; FTE created in 2002, when Florida Office of Toll Operations was folded into FTE
Minnesota Department of Transportation (MnDOT)	DOT	MnDOT	DOT Commissioner; Appointed by the governor	First tolls collected in 2005 by converting high-occupancy vehicle (HOV) lanes to high-occupancy toll (HOT) lanes on I-394
Illinois State Toll Highway Authority (ISTHA)	Independent Toll Authority	Board of directors; Eleven members: governor (ex officio), Secretary of Transportation (ex officio); the chair and eight other directors are appointed by the governor (no more than five of the members may be from one political party)	Executive director; Selected by the board of directors	Illinois State Toll Highway Commission established in 1953; ISTHA established in 1968

TOLL AGENCY	INSTITUTIONAL MODEL	GOVERNING BODY	CHIEF EXECUTIVE	HISTORY
Kansas Turnpike Authority (KTA)	Partnership with DOT	Board of directors; Five members: the Secretary of the Kansas DOT (KDOT); the chairman of the Kansas Senate Committee on Transportation, a member of the House Transportation Committee appointed by the speaker of the House, two appointed by the governor; The Chairman is elected by the members.	As of 2013, KDOT Secretary is also the Director of KTA. KTA's CEO is responsible for daily operations.	Created as quasi-public organization in 1953; Legislatively increased partnership and collaboration with KDOT in 2013

6.1.2 Description and Statistics Comparison

Table 6-2: Comparison of Toll Agencies

	AGENCIES						
	WSDOT	NTTA	NCTA	FTE	MNDOT	ISTHA	KTA
Age (years)	9	48	5	63	11	58	60
Governance	DOT, but varies by project	9-member board	9-member board, but part of DOT	9-member board	DOT	9-member board	5-member board
Tolled miles	40	143	19	480	48	286	236
Annual transactions	36M	647M	34M	768M	2M	838M	38M
Annual toll revenue	$141M	$580M	$30M	$866M	$4M	$969M	$100M
Rate type	Static, Time of Day, and Dynamic	Static	Static	Static	Dynamic	Static	Static
Rate range (2-axle)	$0.00 to $9.00	$0.26 to $3.30	$0.24 to $1.35	$0.50 to approx. $20.00	$0.00 to $8.00	$0.40 to approx. $10.00	$0.85 to approx. $12.00
Collection method(s)	AET/Cash	AET	AET	AET/ORT/Cash	AET	ORT/Cash	ETC/Cash
Vehicle classification basis	Axle Based	Axle Based	Axle Based	Axle Based	N/A	Axle Based	Axle Based
Staff size	58	731	10	420	7	1,686	374
Toll Rate Approval	Commission	Board	Board	ED/CEO	Commissioner	Board	Board

Source: Data compiled from multiple agency Comprehensive Annual Financial Reports (CAFRs) and annual published reports.

6.2 Detailed Case Studies

6.2.1 Washington State DOT (WSDOT)

DESCRIPTION AND STATISTICS

Washington State DOT has been collecting tolls since 2007. They currently operate approximately 40 centerline miles of roadways and bridges, collecting $36 million in revenue on 141 million transactions.

Washington primarily uses tolling as a means to manage congestion and enhance mobility, although tolling does generate revenue for future infrastructure improvements. WSDOT uses a variety of toll rate schemes to help manage congestion including time of day and dynamic pricing. WSDOT currently operates four toll facilities; the SR 520 Bridge, the Tacoma Narrows Bridge, the SR 167 HOT lanes, and the I-405 express toll lanes. Drivers wishing to use WSDOT tolled facilities may open a prepaid Good To Go! account to receive the lowest toll rates, or elect to be invoiced by mail and pay a higher rate. Drivers on the Tacoma Narrows Bridge still have the option to pay their toll with cash at the bridge.

GOVERNANCE

Toll highways and bridges in the State of Washington are currently operated by the WSDOT Toll Division, rather than a separate regional or statewide toll authority. Therefore, toll operations fall under the purview of the Secretary of Transportation, who is appointed by the governor and confirmed by the state legislature. The Toll Division was established in 2009 to operate recently opened and planned toll facilities. Previously, starting as far back as the mid-20th century, 14 toll bridges had been built and financed by the Washington Toll Bridge Authority, and later operated by the Highways Department, a predecessor to modern-day WSDOT.

While WSDOT operates the toll facilities, the Washington State Legislature determines which facilities are authorized for tolling. The toll rates to be charged to motorists are set by the Washington State Transportation Commission (WSTC). The seven appointed members of the WSTC serve staggered six-year terms and are selected by the governor, while the Secretary of Transportation and a representative from the governor's office serve as ex officio members. The WSTC also prepares the state's 20-Year Transportation Plan and sets the fares for Washington State Ferries.

UNIQUE/INTERESTING FINANCING

- Issues toll revenue bonds with additional state general obligation and motor fuel tax pledge
- Secured a federal TIFIA loan

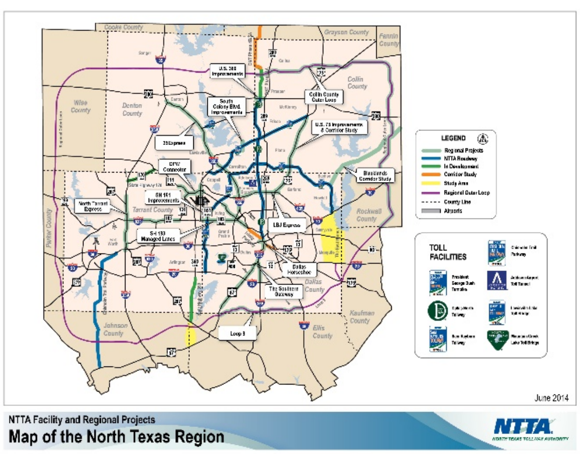
UNIQUE/INTERESTING LEGISLATION

- Legislative authority includes a mandate that the Department of Transportation consider toll implementation options that eliminate tollbooths and provide for interoperability with other systems. §47.56.030(1)(d)
- Legislative or voter approval is required on a project specific basis. §47.56.031
- HOT lanes are authorized only as a pilot project on one section of highway. §47.56.403
- The toll violation process is established by administrative rule and fees imposed as part of the process are tied to the facility where the violation occurred. §47.56.795(6)

UNIQUE/INTERESTING FACTS

- Tolled existing bridge while new bridge was under construction
- Utilized tolling to finance new SR520 bridge (opened with AET in 2011)
- Transitioned to a statewide customer service center
- Implemented a managed lane system in the Seattle area (I-405 Express Toll Lanes opened with AET in 2015)

6.2.2 Texas and the North Texas Tollway Authority (NTTA)



DESCRIPTION/STATISTICS

Texas represents a patchwork of tolling authorities and agencies. Texas DOT (TxDOT) owns or manages several facilities and operates in some instances as a tolling clearinghouse, but many large, independent regional mobility authorities provide tolled infrastructure in different areas of the state.

The North Texas Toll Authority traces its roots back to 1953, though it began operating the first project, for which it is still responsible, in 1966. NTTA operates roughly 143 centerline miles of tolled roadways and bridges including the Dallas North Tollway, the President George Bush Turnpike, the Chisholm Trail Parkway, Addison Airport Toll Tunnel, Mountain Creek Lake Bridge, Sam Rayburn Tollway, and the Lewisville Lake Toll Bridge. In 2014 NTTA collected approximately $580 million on 647 million transactions.

Customers wishing to use NTTA facilities may open a prepaid TollTag account to achieve the lowest toll rate, or alternatively elect to be invoiced by mail using the ZipCash program that results in a higher toll rate.

GOVERNANCE

The NTTA is a Regional Toll Authority (RTA) sanctioned by the State of Texas. It was established in 1997, replacing the Texas Turnpike Authority (TTA), which had been established in 1953. The NTTA is governed by a nine-member board of directors, with members serving staggered two-year terms. Two directors are appointed by each of the four member counties (Collin, Dallas, Denton and Trenton), while the ninth director is appointed by the governor and must live in one of the counties adjacent to one of the four member counties. None of the directors may be an elected official. The board of directors elects its own chair and vice-chair and also hires the CEO/executive director of the NTTA. The NTTA's organization chart is shown in ***Figure 6-1***.

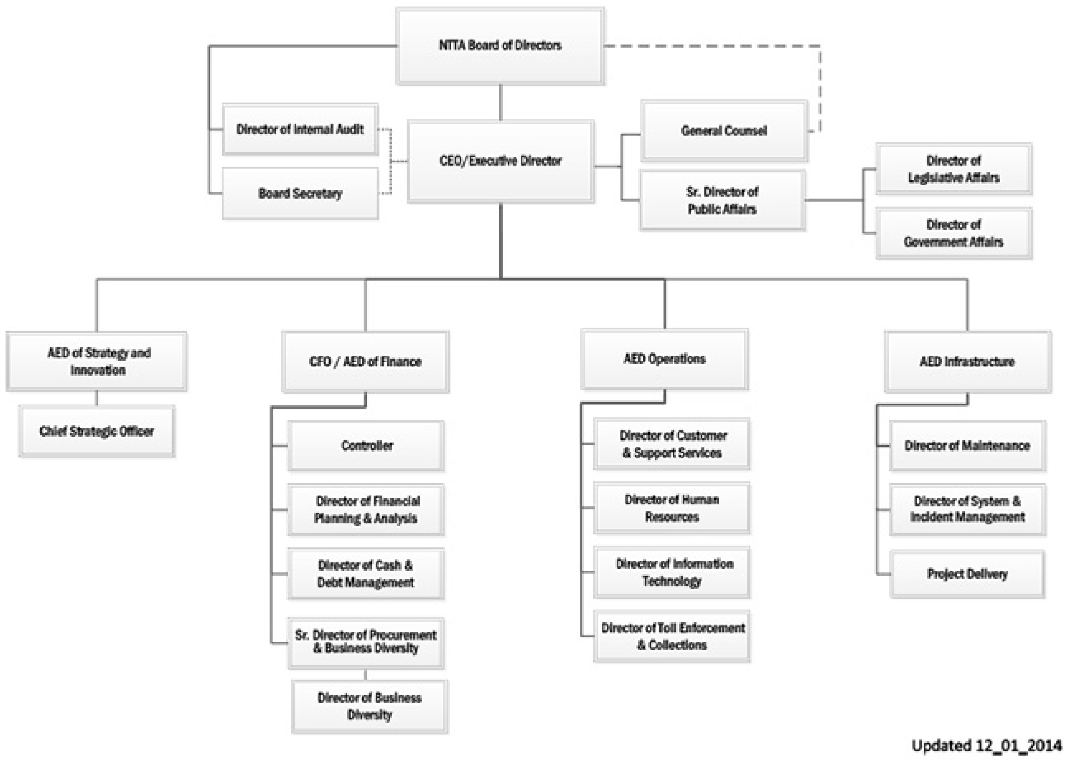


Figure 6-1: Organization Chart for the North Texas Tollway Authority (NTTA)

UNIQUE/INTERESTING FINANCING

- Issues non-recourse system toll revenue bonds
- Issues special project toll revenue bonds with additional TxDOT motor fuel pledge

UNIQUE/INTERESTING LEGISLATION

- Two or more counties may establish a regional tollway authority. §366.031
- A regional tollway authority has the power to establish and combine turnpike systems. Revenue from different systems must be accounted for separately. §366.034
- A regional tollway authority may take advantage of the enforcement authority given to the Department of Transportation and regional mobility authorities. §366.178(j)

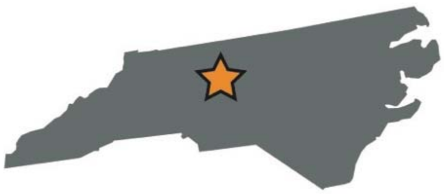
UNIQUE/INTERESTING FACTS

- NTTA successfully expanded their program from 2007 through 2014. A defined Quality Management System (QMS) was used to ensure that numerous designers and construction managers followed NTTA procedures.
- NTTA focused on capital improvement projects on the existing system, widening the Dallas North Tollway, President George Bush Turnpike and Sam Rayburn Tollway.
- NTTA had approximately 3.4 million active TollTags in operation as of June 2015. NTTA continues to look for ways to increase TollTag penetration particularly on President George Bush Turnpike Western Extension and Mountain Creek Lake Bridge.
- Dallas North Tollway (DNT)
  - 31 miles
  - First toll project (except DFW Turnpike turned back to TxDOT)
  - Design-Bid-Build
  - Opened in Phases
    - Downtown Dallas to IH 635: 1968
    - IH 635 to Briargrove: 1987
    - Briargrove to Legacy: 1994
    - Legacy over SRT: 2004
    - SRT to US 380: 2007
      - Converted to AET: 2011
- President George Bush Turnpike (PGBT)
  - 30 miles
  - Design-Bid-Build
  - Opened in Phases
    - SH 78 to Belt Line Rd in Irving: 1998 to 2005
      - Converted to AET: 2009

- PGBT Eastern Extension
  - 10 miles
  - Design-Bid-Build
  - Opened 2011 with AET
    - SH 78 to IH 30
      - Revenue Sharing with TxDOT for the benefit of N. Central Texas region
- Sam Rayburn Tollway (SRT)
  - 26 miles
  - Design-Bid-Build
  - Opened in Phases with AET
    - SH 121 Bus. to US 75: 2008 to 2011
      - Banded Revenue Sharing with TxDOT for the benefit of N. Central Texas region
      - Handback to TxDOT: Sept 1, 2058
- Mountain Creek Lake Bridge (MCLB)
  - 2 miles
  - Design-Bid-Build
  - Opened 1979
  - Converted to AET: 2011
- Addison Airport Toll Tunnel (AATT)
  - 1 mile
  - Design-Bid-Build
  - Opened 1999
  - Converted to AET: 2011
- Lewisville Lake Toll Bridge (LLTB)
  - 2 miles
  - Design-Bid-Build
  - Opened 2009 with AET

- PGBT Western Extension
  - 11.5 miles
  - Phase 1, 2, 3 Design-Bid-Build
  - Phase 4 Design-Build
  - Opened in Phases 2007-2012 with AET
    - SH 183 to IH 20
- Chisholm Trail Parkway (CTP)
  - 27.6 miles
  - Sections 1 - 5 Design-Bid-Build
  - Section 6 Design-Build
  - Opened 2014 with AET
    - IH 30 to US 67
- HOT Lanes
  - NTTA processes all tolls in the region for the NTE, LBJ Express and DFW Connector projects
- Airports
  - NTTA processes all TollTag parking charges at DFW Airport and Love Field

6.2.3 North Carolina Turnpike Authority (NCTA)



DESCRIPTION/STATISTICS

The North Carolina Turnpike Authority began collecting tolls on the Triangle Expressway, currently its only project open to traffic, in 2011. Like many toll authorities, NCTA is growing aggressively with seven additional projects either under construction, authorized, or under development. Unlike any other U.S. toll authority, NCTA was the first agency to adopt all-electronic on its inaugural project. The Triangle Expressway has 19 miles of centerline tolled roadway, and in 2015 collected approximately $30 million in revenue on 34 million tolled transactions.

Customers wishing to use NCTA facilities may open a prepaid NC Quick Pass account to achieve the lowest toll rate, or chose to be invoiced by mail and pay a higher toll rate. NCTA is interoperable with both SunPass (in Florida) and E-ZPass (on the east coast and in the Midwest).

GOVERNANCE

The NCTA was originally established as an independent state agency in 2002. However, in 2009, the agency was transferred into the North Carolina Department of Transportation (NCDOT). The authority is governed by a nine-member board of directors, with members serving staggered four-year terms. Four members are appointed by the governor; two are appointed by the president pro tempore of the North Carolina Senate; and two are appointed by the speaker of the North Carolina House of Representatives. The Secretary of the NCDOT is the ninth member and is also appointed by the governor. The board of directors hires an executive director of the authority.

UNIQUE/INTERESTING FINANCING

- Issues non-recourse toll revenue bonds
- Secured a federal TIFIA loan
- Issued state appropriation bonds to supplement the financing plan

UNIQUE/INTERESTING LEGISLATION

- The North Carolina Turnpike Authority is a distinct corporate body under the direct supervision of both the Secretary of Transportation and a board of directors. §136-89.182
- With limited exception, the authority must consult with a joint legislative commission before developing new toll projects. §186.89.183 (a)
- With limited exception, the conversion of existing state highways to tolled highways is prohibited. §136.89-187
- Existing Interstate highways may be tolled if allowed by the U.S. DOT. §136-89.189
- Toll revenue may only be used for the turnpike system. Only five percent of toll revenue may be used for administrative costs. §136-89.188
- Tolls must be removed when bonds are repaid. §136-89.136

UNIQUE/INTERESTING FACTS

- The NCTA has interoperability agreements with E-ZPass, Florida's SunPass and Georgia's Peach Pass, making the NCTA one of the most interoperable agencies in the U.S.
- Triangle Expressway
  - NCTA's first toll project
  - Design-build
  - Opened: 2012 (initial Phase)
  - AET since inception
- I-77 Express Lanes
  - P3 (Cintra)
  - Reached commercial and financial close
  - 1st Segment opened to traffic: September 2017 target
  - First managed lane in North Carolina
  - Dynamic pricing

6.2.4 Florida and Florida's Turnpike Enterprise (FTE)

DESCRIPTION/STATISTICS

Like Texas, Florida has numerous toll authorities. Florida's Turnpike Enterprise is the oldest and largest toll authority in the state. Recently Florida has moved to consolidate back-office operations for all toll transactions in the state to a single back-office. The effort is meant to drive costs down by capturing economies of scale discounts on over one billion transactions annually.

The FTE dates back to 1953, although it has undergone a series of organizational and administrative changes since then. The FTE collects tolls on approximately 480 miles of roadway and bridges generating $866 million in revenues on 768 million transactions. The FTE operates several toll facilities that collect tolls by AET, although some maintain cash collection in conjunction with ORT lanes.

GOVERNANCE

The FTE operates as a separate business unit of the Florida Department of Transportation (FDOT). It was originally created in 1953 as the Florida State Turnpike Authority (FSTA), under which the state's first toll road, the Sunshine State Parkway (now part of Florida's Turnpike), was built and opened in 1957. The FSTA was incorporated into the newly-formed FDOT in 1969, with operations of various segments of the Turnpike managed by the individual districts within FDOT. In 1988, the Office of Florida's Turnpike was created in order to oversee renovations and improvements to the turnpike. The FTE was established in its current form in 2002, when the Florida Office of Toll Operations, a formerly separate state agency, was folded into the FTE. The FTE is led by an executive director/CEO, who is selected by the Secretary of FDOT. The organization chart for FTE (as of November 2014) is shown in ***Figure 6-2***.

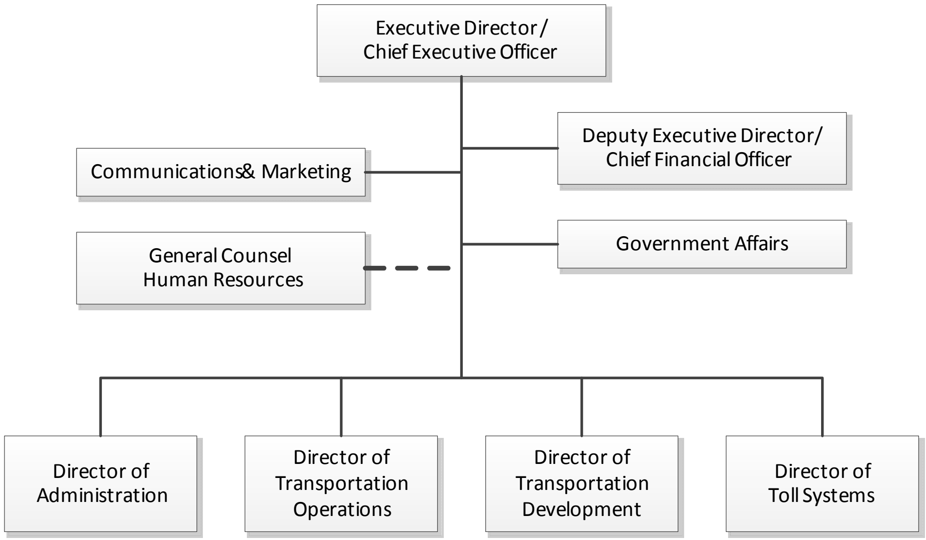


Figure 6-2: FTE's Organization Chart (November 2014)

UNIQUE/INTERESTING LEGISLATION

- Toll rates are established through the administrative rulemaking process which requires public hearings. §338.231
- When bonds are repaid, the turnpike system remains subject to sufficient tolls to pay the cost of the maintenance, repair, improvement and operation of the system and the construction of new turnpike projects. § 338.232
- FTE employees are exempt from certain public employee requirements. The director must have proven financial experience. § 338.2216
- The FTE has all the powers of the Department of Transportation. Powers specifically granted to the authority are supplemental to the powers of the department. The authority's powers supersede those of the department in the event of a conflict. §338.2216

UNIQUE/INTERESTING FACTS

- Start of ETC in 1999 (SunPass)
- AET implementation on the Homestead Extension of Florida's Turnpike (HEFT), Sawgrass Expressway and Veterans Expressway
- Statewide interoperability
- Regional interoperability with Georgia and North Carolina

- Express lanes on Interstate 95 and Interstate 595
- Express lanes on a toll facility (HEFT and Veterans Expressway)
- Sunshine State Parkway

6.2.5 Minnesota Department of Transportation (MnDOT)

DESCRIPTION/STATISTICS

Minnesota Department of Transportation implemented express lanes on Interstate 394, Interstate 35E and Interstate 35W. These projects are dynamically priced, using tolls as a tool to help relieve traffic congestion. Trips are free during certain periods of the day and can range up to $8 when traffic is heavy to discourage additional vehicles from entering the lanes. This helps ensure that those customers that pay to use the express lanes experience reliably faster travel than motorists that elect not to use the express lanes.

Combined, the MnDOT toll projects represent 48 miles of centerline roadway. In 2015, MnDOT collected approximately $4 million on two million toll transactions. Customers wishing to use these tollways must open a prepaid MnPASS account before travelling in the express lanes. There is no option to pay an invoice by mail; drivers that use the lanes without a MnPASS account are subject to a steep fine.

GOVERNANCE

Toll facilities in Minnesota are operated directly by MnDOT's Metro district office in the Twin Cities. Therefore, operations and management of the MnPASS Express Lanes are under the purview of the commissioner of MnDOT, who is appointed by the governor. Authorization to convert high-occupancy vehicle (HOV) lanes to high-occupancy toll (HOT) lanes was granted through legislation by Minnesota's Legislature and governor in 2003. Additional legislation in 2008 expanded MnDOT's ability to utilize toll facilities by allowing the designation of priced dynamic shoulder lanes, which were implemented on Interstate 35W in 2009.

UNIQUE/INTERESTING LEGISLATION

- A road authority (which includes cities and townships) may develop and operate a toll facility or may contract with a private entity to develop and operate the facility. §160.85, §160.88
- Bonds must be payable only from toll revenue. No other funds or property of the road authority may be pledged or mortgaged to secure bond payment. §160.89
- Two or more road authorities can jointly develop a toll facility. §160.91

6.2.6 Illinois State Toll Highway Authority (ISTHA)

DESCRIPTION/STATISTICS

The Illinois State Toll Highway Authority opened its first toll road in 1958. ISHTA operates a mature network of 286 miles of centerline roadway, collecting $969 million in annual toll revenues on approximately tolled 838 million transactions. ISHTA uses a mix of cash lanes and ORT, with a differential toll rate that rewards customers using the prepaid I-Pass account.

Like many U.S. turnpike authorities established during the 1950's and 60's, the original 187-mile ISTHA system was planned to become a toll free system once bonds were repaid. To provide for operation, maintenance, renewal and rehabilitation, and to ensure available funding exists for needed future expansion, tolls have remained in place. This forward-looking approach allows ISHTA to continue to provide motorists the traveling experience to which they have become accustomed. It also allows ISTHA to remain financially distinct from and independent of the Illinois Department of Transportation (IDOT).

GOVERNANCE

The Illinois State Toll Highway Commission was established in 1953, five years before the opening of the first sections of the Tri-State and East-West Tollways. ISTHA replaced the Commission in 1969. ISTHA is a revenue bond-financed administrative agency of the State of Illinois. It is governed by an 11-member board of directors. The governor and the Secretary of Transportation serve as ex officio members. The chair and eight other directors are appointed by the governor with advice and consent of the Illinois Senate and serve staggered four-year terms. No more than five of the directors appointed by the governor

may be from one political party. The board of directors hires an executive director for ISTHA, which does not require legislative approval.

UNIQUE/INTERESTING LEGISLATION

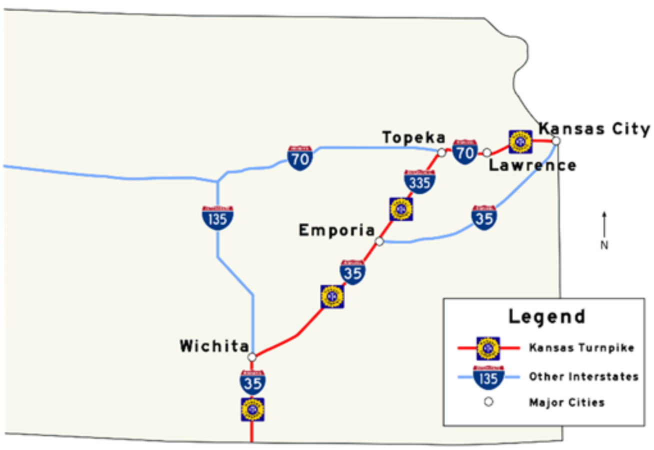
- ISTHA may exercise all the powers under the Public-Private Partnerships for Transportation Act. 605 ILCS §10/11.1
- Governor approval is required before commencement of any engineering and traffic study or studies to determine the feasibility of constructing additional toll highways. An advisory committee must be created for each county in which additional toll highways will be developed. 605 ILCS §10/14
- The governor must appoint an inspector general for toll highways. 605 ILCS §10/8.5
- ISTHA must develop a privacy policy to protect information collected through electronic toll transactions. Once developed, information identified in the privacy policy is exempt from disclosure through the state's public records laws. 605 ILCS §10/19.1

UNIQUE/INTERESTING FACTS

- ISTHA has completed four years ($4.2 billion) of a 15-year $12 billion capital improvement program (Move Illinois Program)
- I-90 Widening and Reconstruction
  - 62 miles
  - Traditional design-bid-build
- Elgin O'Hare Western Bypass
  - 15 miles of new 6-lane tolled roadway
  - Traditional design-bid-build
- ISTHA is also working with the state to develop legislation to possibly gain authority for construction manager/general contractor (Construction Manager at Risk) or design-build implementation.

6.2.7 Kansas Turnpike Authority (KTA)

DESCRIPTION/STATISTICS



The Kansas Turnpike Authority is currently celebrating its 60th anniversary. The KTA operates 236 miles of toll road, collecting just over $100 million in revenue during fiscal year 2015 on 38 million transactions.

Like Illinois, Kansas provides customers with the ability to pay in cash at the lane, but also offers lower toll rates and faster service through the use of their K-TAG transponder program. In the past few years, Kansas has made strides in interoperability. In 2014 KTA became interoperable with the Oklahoma Turnpike Authority, and in 2017 they will become interoperable with multiple toll agencies in Texas and southern states including Florida and Georgia.

GOVERNANCE

The KTA was established in 1953 as a quasi-public organization to construct the toll road without any State of Kansas debt. In 2013 state legislation brought the KTA into a partnership with the Kansas Department of Transportation (KDOT). The KDOT Secretary also serves as the director of the KTA, while the KTA also has its own CEO responsible for daily operations. The board of directors is composed of five members: the KDOT Secretary, the chairman of the Kansas Senate Committee on Transportation, the Chairman of the House Transportation Committee, and two members appointed by the governor to serve four-year terms.

UNIQUE/INTERESTING LEGISLATION

- The Secretary of Transportation and the KTA may contract with each other for services. Duplication of effort, facilities and equipment shall be minimized by the KTA and the Secretary of Transportation. §68-2021, §68-2021a

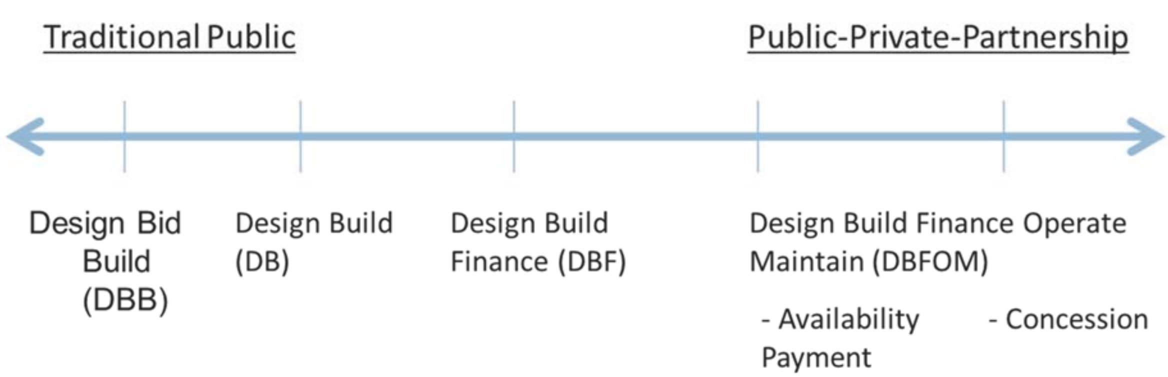
- Turnpike revenue may be used only for the financing, maintenance, repair and operation of the turnpike system. §68-2009

UNIQUE/INTERESTING FACTS

- KTA is interoperable with the Oklahoma Turnpike Authority and progresses towards interoperability with additional toll agencies in central and southeastern states, including Texas, Florida and Georgia
- KTA recently considered conversion to full AET; however, after further analysis determined it created too much risk to revenues and ORT was the better option for the near term. ORT facilities are currently being implemented at the three mainline toll plazas and will be designed and deployed between 2017 and 2019.

6.3 Alternative Project Deliveries

Public-Private-Partnerships (P3s) have played a role in developing new greenfield toll projects as well as privatizing existing brownfield toll projects in the U.S. The current U.S. P3 market began in earnest with the long-term concession leases involving large upfront payments to public owners of existing toll assets with low toll rates (Chicago Skyway and Indiana Toll Road) in 2005 and has since focused more on developing large greenfield toll projects. The graphic below shows the spectrum of project delivery options:



P3s could be an option to implement tolling on an Interstate System. Design-Build-Finance-Operate-Maintain (DBFOM) delivery approaches allow public transportation owners the ability to accelerate and implement new projects or seek an upfront payment for an existing toll asset while transferring many of the associated short-term and long-term risks to the private sector. DBFOM delivery also introduces private equity into the financing, which can produce additional upfront proceeds to fund the capital needs of a project. The private financing eliminates the need for public owner debt on the transaction. The two main types of DBFOMs are described below.

TOLL CONCESSION

- Operates as a long-term lease in which the private sector is obligated to design, construct, finance, operate and maintain a toll facility over the life of the concession
- Private concessionaire bears the toll revenue risk that traffic demand will be less than what is forecast
- Tolls are collected and retained by the concessionaire as compensation for up front financing, risk assumption and operations
- Can result in the concessionaire paying the public owner an upfront payment for the concession or may require a public subsidy to deliver the project depending on projections of revenue
- Concession terms typically range from 50-99 years
- Also called Demand or Revenue-Risk Concession due to the traffic and revenue risk

AVAILABILITY PAYMENT TRANSACTION

- Public owner makes annual availability payments to concessionaire from a general source of government revenues based on the facility “being made available” according to the contractual operating and performance standards (typically a state’s transportation trust fund is pledged to repayment)
- Facility can be tolled or non-tolled
- Private entity’s compensation is not tied to the revenue generated on the facility
- If the facility is tolled, the public owner controls the toll rates and keeps all resulting toll revenue (public owner retains the demand and revenue risk)
- Terms typically range from 25-40 years

P3 delivery could be utilized to improve, as well as operate and maintain, an Interstate System or individual corridors. Under the toll concession model, the public owner could identify any required capital improvements and operational standards as well as boundaries for toll rates. Based on the resulting forecast of revenues and expenditures, it is possible that the valuation would produce an upfront payment from the private sector concessionaire to the public owner for the right to collect and retain the toll revenue. The concessionaire would be responsible for any capital investments required in the contract and to operate and maintain the road according to operating standards for the life of the concession. The toll concession could include the reconstruction or widening of any corridor in a certain period of time. The Commonwealth of Pennsylvania accepted bids for a 75-year toll concession on the Pennsylvania Turnpike (I-76) in 2008, but ultimately the Legislature rejected the $12.8 billion preferred bid and retained public operation of the facility.

Availability payment transactions are primarily utilized to finance large capital projects. For an Interstate System, this would include any reconstruction or widening projects, and the public owner would retain control over toll rates and toll revenues. Under both the toll concession and availability payment methods, the public owner benefits from the innovation of the private sector and transfers significant construction, financing and lifecycle risks to the private sector. The private sector expects to be compensated for delivering on the contract and receive a return on its investment.

P3s are not appropriate for every project and require significant due diligence and additional legislation. The following two case studies illustrate how P3s can be utilized for new greenfield construction as well as to privatize an existing toll asset. Virginia has emerged as a leading state for developing toll projects through toll concessions, but they also develop toll projects through the Virginia Department of Transportation and regional toll entities. Indiana is the best example of a state utilizing a P3 toll concession to transfer operations to a private sector partner in return for a large upfront payment.

6.3.1 Virginia Department of Transportation (VDOT)

Tolling and private sector participation has a long and diverse history in the Commonwealth of Virginia. Virginia currently has 15 different toll facilities operated by 10 different entities. The Virginia Department of Transportation (VDOT) currently owns and operates two facilities (Coleman Bridge and Powhite Parkway Extension) and is implementing a managed lane facility for the I-66 corridor, also referred to as I-66 Inside the Beltway, that will be under its control. Several governmental and quasi-governmental special purpose toll entities operate regional toll facilities in the Commonwealth, including the City of Chesapeake, Richmond Metropolitan Transportation Authority, Metropolitan Washington Airports Authority, and Chesapeake Bay Bridge and Tunnel District. Virginia has used its P3 Office to develop several projects under long-term DBFOM toll concession structures for the Capital Beltway I-495 Express Lanes, I-95 Express Lanes, Elizabeth River Tunnels and Pocahontas Parkway. The P3 Office is also currently under procurement for Transform 66 – Outside the Beltway and in negotiations with a concessionaire on implementing the I-395 Express Lanes as an extension to the I-95 Express Lanes. Additionally, the Dulles Greenway and South Norfolk Jordan Bridge are completely privately owned and operated toll facilities in Virginia. The City of Chesapeake is expected to open the Dominion Boulevard toll facility by the end of 2016.

Virginia's Office of Public-Private Partnerships (VAP3) is responsible for developing and implementing a statewide program for project delivery via the Public-Private Transportation Act (PPTA) of 1995, the Public-Private Education and Facilities Act (PPEA) of 2002, and other alternative project delivery methods. The Virginia P3 office works in conjunction with the Secretary of Transportation, Virginia Department of Transportation, Department of Rail and Public Transportation, Department of Aviation, Department of Motor Vehicles, Commercial Space Flight Authority, and the Virginia Port Authority, and focuses on the development of public-private projects across all modes of transportation.[12]

While Virginia maintains ownership and oversight of these P3 projects, the PPTA enables the Commonwealth to shift key risks to the private sector, such as financing, construction and operations, and providing protection to Virginia's taxpayers. By using private capital and privately backed debt, the Commonwealth can avoid taking on increased debt, preserve bond capacity and protect public credit ratings. The PPTA also allows the Commonwealth to shift long-term operations and maintenance responsibilities to the private sector.[13]

VDOT's Toll Operations Division reports to the Chief Financial Officer and manages the roadside operations of two VDOT operated toll facilities. The Toll Operations Division is staffed by approximately ten professionals and has two to five personnel assigned to each facility. The Toll Operations Division manages the staffing and maintenance of roadside and back-office functions through third-party contracts.

As a member of the E-ZPass Group, VDOT manages a statewide clearinghouse of all E-ZPass transactions in Virginia for both public and private toll facilities. VDOT does this through a toll services agreement with each toll facility to provide all services necessary for the administration and operation of toll collection accounts through E-Z Pass, including customer service, the distribution of transponders, and the collection of tolls through an automated reciprocal exchange of electronic toll transactions with out-of-state E-ZPass customer service centers. Optionally, some toll facilities engage VDOT to provide additional services for violations processing, such as pursuit and collection of unpaid tolls through the courts. The services agreement includes a schedule of fees for processing transactions and violations.

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[12] Source: http://www.p3virginia.org

[13] Source: http://www.p3virginia.org

The operators of each toll facility are responsible for the purchase of all roadside tolling equipment and services necessary to operate and maintain their facility's toll collection system and comply with E-ZPass. Through an automated interface with each toll facility,
E-ZPass transactions are transmitted each day to VDOT for processing, and VDOT provides settlement within 24 to 72 hours. VDOT is not responsible for any lost revenue suffered due to equipment failure or error in the toll facilities electronic toll collection system unless VDOT's own system fails.

6.3.2 Indiana Toll Road (ITR)

The Indiana Toll Road (ITR) is a 157-mile facility on I-90 spanning northern Indiana that links the Chicago Skyway in the west with the Ohio Turnpike in the east. The facility was opened to traffic in 1956 and by 2014 was collecting approximately $210M per year in toll revenues on roughly 90,000 average annual daily traffic full length equivalent trips. The ITR is owned by the Indiana Finance Authority and until 2006 was operated and maintained by the Indiana Department of Transportation (INDOT).

In 2006, then Indiana Governor Mitch Daniels successfully lobbied the legislature for permission to lease the ITR to a private concessionaire. The centerpiece of his Major Moves campaign, the 75-year toll concession allowed a joint venture of Cintra and Macquarie known as the Indiana Toll Road Concession Company (ITRCC) the right to operate, maintain, set (within boundaries) and collect revenues on the ITR in exchange for a one-time upfront payment of $3.8 billion. The large valuation was primarily driven by the ability to return toll rates to market levels at the beginning of the concession and allowing for tolls to increase according to an annual index formula. With the large toll rate increases imbedded into the concession contract, Indiana was able to leverage an underutilized asset, which had not experienced a toll rate increase during the previous 20 years, to provide an infusion of cash that allowed much needed surface transportation projects across the state to be built in an expedited manner. Furthermore, the lease required ITRCC to provide substantial investments and upgrades to the ITR in the first few years, correcting decades of accumulated deferred maintenance on the facility.

In 2014, the ITRCC sought Chapter 11 bankruptcy protection citing traffic and revenue underperformance as a result of the great recession and an unsustainable debt structure. In 2015, a new group of equity investors paid $5.725 billion for the right to collect the remaining 66 years of the original 75-year lease. Indiana kept the original $3.8 billion it was paid for the lease, the IFA maintained ownership and control of the asset, and there were no disruptions to facility operations during the bankruptcy period.

When ITRCC assumed operations in 2006, the facility was cash only but has since expanded to include electronic toll collection. Approximately 550 INDOT workers at the time were assigned to the ITR, most as toll attendants. Approximately 85 percent of those workers were hired by ITRCC, while the remaining transitioned to other jobs within INDOT or other state agencies.

APPENDIX A: Definitions (Common Terms and Acronyms)

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Unless otherwise noted, all descriptions and definitions are from the *International Bridge, Tunnel and Turnpike Association (IBTTA) Glossary of Terms, 2014 Edition*.

TERM (ACRONYM)	DESCRIPTION/DEFINITION
A	
American Association of Motor Vehicle Administrators (AAMVA)	Represents the state and provincial officials in the United States and Canada who administer and enforce motor vehicle laws. AAMVA encourages uniformity and reciprocity among the states and provinces and develops model programs in motor vehicle administration, law enforcement and highway safety.
American Association of State Highway and Transportation Officials (AASHTO)	Is an interest group based in Washington, DC, involved in research, advocacy and technical assistance. Primary focus is highways. AASHTO is also a standard setting organization.
Account	Each On-Board Unit (OBU) is assigned to a User's Account. The Account serves as the final destination for system transactions. For a pre-paid account the User periodically credits funds (from a Fiduciary) to the Account to offset the transaction cost.
Account Processor	Is a third party organization that processes Accounts and transactions for an Issuer. For example, retailers who issue credit cards often contract account processing to third party companies like Payment Tech. In tolling, third-party Account Processors often operate customer service center (CSC) entities.
Automated Clearinghouse (ACH)	Is a financial transaction network operated by the Federal Reserve. The ACH processes a number of different types of financial transactions including inter-bank transactions, credit card transactions, E-checks (a form of electronic payment), etc.
Automated Coin Machine (ACM)	Unattended machines used for toll payment by coinage
Average Daily Traffic (ADT)	The total traffic volume during a given time period divided by the time period
All-Electronic Tolling (AET)	Technology which enables cashless toll collection, either through transponders and/or license plate readers, eliminating the necessity of stopping the vehicle to pay the toll. AET is sometimes referred to as "cashless" tolling.
All-Electronic Tolling Conversion (AETC)	Process of changing a toll collection method from manual cash payments to fully automated electronic payments.

TERM (ACRONYM)	DESCRIPTION/DEFINITION
Association of Electronic Toll and Interoperable Services (AETIS)	Association representing European Electronic Toll Services (EETS) providers as a stakeholder group with regard to the European Union (EU).
Aggregation	Transaction processing costs in electronic toll collection can be a significant component of an Issuer's operating costs. To minimize this cost, Issuers often aggregate groups of transactions from Service Providers into a single transaction that is sent to the Fiduciary. This lowers the transaction cost by splitting the credit card transaction fee across a number of transactions. For example, a customer service center (CSC) may collect all transactions for a period of time and Aggregate those transactions into a single credit card charge to the User's card account. As a result the Authority pays only a single transaction fee.
Automatic Number Plate Recognition (ANPR)	Is a technology for automatically reading vehicle number plates.
American National Standards Institute (ANSI)	Is the primary organization for fostering the development of technology standards.
Application	This is the software that runs on the On-Board Unit and RSU Application Platform. The Application contains the "brains" (i.e. logic) that conducts the transaction using the Public and Private Keys (see below).
Application Platform	This is the computer that is collocated with the On-Board Unit and Roadside Unit. It runs the Application, or software that conducts the transaction.
American Public Transportation Association (APTA)	The American Public Transportation Association (APTA) advocates the advancement of public transportation. APTA members are public organizations that are engaged in the areas of bus, paratransit, light rail, commuter rail, subways, waterborne passenger services, and high-speed rail.
American Trucking Associations (ATA)	Is the national trade association for the trucking industry.
Alliance for Toll Interoperability (ATI)	Organization established to promote and implement toll collection interoperability among states and agencies. ATI's goals include establishing Interstate customer video tolling and interoperability, establishing protocols and systems allowing for secure sharing of vehicle information and the investigation of RFID toll technology interoperability. ATI's membership consists exclusively of toll facility operators.

TERM (ACRONYM)	DESCRIPTION/DEFINITION
Automatic Teller Machine (ATM)	An electronic telecommunications device that enables the customers of a financial institution to perform financial transactions without the need for a human cashier or clerk
Authority	A legal jurisdiction created to operate tolled infrastructure (e.g., E-470 Public Highway Authority, New York State Thruway Authority, North Texas Tollway Authority). Also known as the “District” in some states.
Automatic/Automated Vehicle Identification (AVI)	A system which transmits signals from an on-board tag or transponder to roadside receivers for uses such as electronic fee collection and stolen vehicle recovery.
Automatic/Automated Vehicle Classification (AVC)	Determines the type of vehicle (car, truck, bus, etc.) and the vehicle characteristics (weight, number of axles, tires, etc.) as required for toll classification.
Automated Vehicle Identification (AVI)	A system which transmits signals from an on-board tag or transponder to roadside receivers for uses such as electronic fee collection and stolen vehicle recovery.
B	
Back-office system	Database system that enables registration and maintenance of customer accounts; facilitates funds transfer between participating Authorities.
Barrier System	A toll system, parking facility, etc. wherein the customer must come to a partial or full stop at a barrier until the payment has been processed.
Beacon	Also known as Road-Side Unit and RSU. The roadside infrastructure component of an ETC system; a receiver or transceiver that identifies the On-Board Unit in the vehicle and identifies the account, permitting an electronic toll transaction to occur.
C	
Closed Circuit Television (CCTV)	Is a TV system in which signals are not publicly distributed but are monitored.
Classify	To determine the category of the vehicle to be tolled based upon its specific structure, weight, axles, tires, etc.
Clearinghouse (Financial)	A Clearinghouse Network routes transactions for reconciliation. The term applies to all types of financial transactions, not just toll transactions. Examples of Clearinghouses (or Clearinghouse Networks) include the Federal Reserve Automated Clearinghouse Network (ACH), VISA, MasterCard, American Express, Pulse and Cirrus. It is important to note the distinction between a Clearinghouse and a Fiduciary (defined below): A Fiduciary converts transactions into Funds, Clearinghouse routes transactions to Fiduciaries.

TERM (ACRONYM)	DESCRIPTION/DEFINITION
Clearinghouse (Toll Authorities)	Provides all requisite financial services to transfer monies between participating Authorities; provides accurate and timely downloads of customer accounts, violations and all other information necessary for an interoperable system.
Closed Barrier System	A facility that has both mainline toll barriers as well as ramp toll plazas, placed such that no toll-free traffic movement is permitted.
Closed System	A system that monitors your entrance and exit and calculates the toll on the basis of distance traveled.
Concession	A grant of a tract of land made by a government or other controlling authority in return for stipulated services or a promise that the land will be used for a specific purpose. In some cases this will mean the exclusive right to market some product like fuel or food on a turnpike. In the U.S. it increasingly relates to leased space in a rest area. In some instances, both inside and outside the U.S. the concession is the road itself and a private company operates the road for a profit under agreed upon guidelines or payments. This is especially true in European countries.
Concessionaire company	Mainly in Europe: A company which is awarded, by a conceding Administration, the operation of a toll facility. Usually the contract includes the design, construction, financing and operation of the facility.
Congestion Pricing	Also called Value Pricing refers to variable road pricing (higher prices under congested conditions and lower prices at less congested times and locations) intended to reduce peak-period vehicle trips. Tolls can vary based on a fixed schedule, or they can be dynamic, meaning that rates change depending on the level of congestion that exists at a particular time. It can be implemented when road tolls are implemented to raise revenue, or on existing roadways as a demand management strategy to avoid the need to add capacity. Some highways have a combination of un-priced lanes and Value Priced lanes, allowing motorists to choose between driving in congestion and paying a toll for an un-congested trip. This is a type of Responsive Pricing, meaning that it is intended to change consumption patterns (Vickrey, 1994).
Connected Vehicle	The U.S. DOT Research and Innovative Technology Administration (RITA) \ ITS Joint Program Joint Program Office (ITS JPO) is the major sponsor of the Connected Vehicle program. Connected Vehicle focuses on localized Vehicle-to-Vehicle, Vehicle-to-Infrastructure and Vehicle-to-Device Systems (V2X) to support safety, mobility and environmental applications using vehicle Dedicated Short Range Communications (DSRC)\Wireless Access for Vehicular Environments (WAVE). This program has support from most of the automakers and a number of state departments of transportation.

TERM (ACRONYM)	DESCRIPTION/DEFINITION
Cordon (Area) Tolls	Are fees paid by motorists to drive in a particular area, usually a city center. Some cordon tolls only apply during peak periods, such as weekdays. This can be done by simply requiring vehicles driven within the area to display a pass, or by tolling at each entrance to the area.
Customer Service Center (CSC)	A facility used to service customers.
D	
Dedicated ETC Lane	A lane in which only electronic toll transactions are processed.
Dedicated Short Range Communication	A short to medium range communications service that supports both Public Safety and Private operations engaged in roadside-to-vehicle and vehicle-to-vehicle communication environments. DSRC is meant to be a complement to cellular communications by providing very high data transfer rates in circumstances where minimizing latency in the communication link and isolating relatively small communication zones are important. Typically this refers to 5.9GHz communication.
Dynamic Message Sign (DMS)	Also known as Variable Message Sign (VMS) is a changeable message boards located on a facility that display to customers text information such as weather and road conditions that may affect traffic conditions and travel times.
Department of Transportation (DOT)	Agency (either state or federal) that oversees local or national transportation systems.
Dedicated Short Type Range Communication (DSRC)	A short to medium range communications service that supports both Public Safety and Private operations engaged in roadside-to-vehicle and vehicle-to-vehicle communication environments. DSRC is meant to be a complement to cellular communications by providing very high data transfer rates in circumstances where minimizing latency in the communication link and isolating relatively small communication zones are important. Typically this refers to 5.9GHz communication.
E	
Electronic Fee Collection (EFC)	See “Electronic Road Pricing”
Electronic Funds Transfer	Process by which payments associated with toll passage, parking fees, etc. are communicated from the Authority maintaining the Customer account to the Authority providing the service.
Electronic Payment Services (EPS)	Any use of an On-Board Unit to pay for a service.
Electronic Toll Collection (ETC)	The collection of tolls based the automatic identification and classification of vehicles using electronic systems.

TERM (ACRONYM)	DESCRIPTION/DEFINITION
Electronic Road Pricing (EPR)	Is a system used for managing road congestion. Based on a pay-as-you-use principle, motorists are charged when they use priced roads during peak hours. ERP rates vary for different roads and time periods depending on local traffic conditions. This encourages motorists to change their mode of transport, travel route or time of travel.
ETC Lane	A toll lane that accepts ETC as toll payment from a driver, without having to stop.
Electronic Vehicle Registration (EVR)	Electronic vehicle registration (EVR) uses radio frequency identification technology (RFID) to electronically identify vehicles and validate the identity, status and authenticity of vehicle data. A unique electronic identification code is established for each vehicle via a tamper-resistant windshield sticker tag, and each unique code is linked to a record in the centralized owner/vehicle-based database. EVR can be used to automate vehicle registration, reduce car theft and other fraudulent activities and increase tax and toll revenues.
Express Lane	A popular naming convention used to depict and differentiate it from other types of Electronic Toll Collection lanes, an Express Lane is an ETC lane where vehicles pass the collection point (Gantry, plaza, Road-Side Unit) at highway speeds without stopping.
E-ZPass	The E-ZPass Group is an association of 25 toll agencies in 15 states that operates the E-ZPass electronic toll collection program. E-ZPass is the world leader in toll interoperability, with more than 24 million E-ZPass devices in circulation.
F	
FasTrak	The trade name of electronic toll collection in California (e.g. E-Z Type Pass, Sun Pass, etc.)
Federal Highway Administration (FHWA)	Is a part of the U.S. Department of Transportation and is headquartered in Washington, D.C., with field offices across the United States.
Fiduciary	The Fiduciary as used here is a bank, credit card company, etc. that functions as the funds source to replenish the User’s Account.
Florida's Turnpike Enterprise (FTE)	Is a business unit of the Florida Department of Transportation (FDOT). The FTE is responsible for all operations on every FDOT owned and operated toll road and bridge, representing about 600 miles of roadway and 80 percent of all toll facilities in Florida.
G	
Gantry	A physical structure, generally located over the toll lanes, used for the location of ETC equipment, signs, etc.

TERM (ACRONYM)	DESCRIPTION/DEFINITION
Global Positioning System (GPS)	Used for positioning and road segment identification. Similar to GALILEO.
H	
Highway Capacity Manual (HCM)	An engineering reference manual for road design.
High-Occupancy Toll Lanes (HOT Lanes)	Are high-occupancy vehicle (HOV) lanes that also allow access to low occupancy vehicles if drivers pay a toll. It is a type of managed lane. This allows more vehicles to use HOV lanes while maintaining an incentive for mode shifting and raising revenue. HOT lanes are often proposed as a compromise between HOV lanes and Road Pricing.
High Occupancy Vehicle (HOV) Lanes	Lanes typically reserved for vehicles with two or more occupants.
Hub	Or “Clearinghouse Hub”, is a node on the Clearinghouse Network, interfaces to all other Hubs on the Clearinghouse Network.
I	
Interagency Group (IAG)	The E-ZPass Interagency Group is the entity responsible for creating and administering E-ZPass, collaboration between 21 member agencies on the east coast of the United States that provides interoperable electronic tolling.
International Bridge, Tunnel and Turnpike Association (IBTTA)	Is the worldwide alliance of toll operators and associated industries that provides a forum for sharing knowledge and ideas to promote and enhance toll-financed and other direct-user-fee-financed transportation services.
Interoperability (IOP)	A cooperative arrangement established between public and/or commercial entities (Authorities, parking lot operators, etc.) wherein tags issued by one entity will be accepted at facilities belonging to all other entities without degradation in service performance.
International Organization for Standardization (ISO)	An association composed of representatives of several national standards bureaus
Intelligent Transportation Systems (ITS)	A broad range of diverse technologies, including information processing, communications, control and electronics, which, when applied to our transportation system, can save time, money and lives.

TERM (ACRONYM)	DESCRIPTION/DEFINITION
L	
Lane Controller	A specific type of in-lane (generally, but not always) equipment used to respond to or detect in-lane sensors (AVI Reader, treadles, beam detectors, loops, etc.) and using precision algorithms, make appropriate decisions (raise gate, take violation image, activate driver feedback lights, etc.).
Loop Detector	A vehicle sensor used either to count or detect the presence of a vehicle in the toll lane. The metallic mass of a vehicle located above wires laid in the concrete produce electromagnetic signals that can be sensed electronically.
M	
Managed Lanes	Are highway facilities or lanes whose operation is modified in response to changing traffic conditions. A managed lane operates as a “freeway-within-a-freeway” and is separated from the general-purpose lanes. Examples include high-occupancy vehicle (HOV) lanes, value priced lanes, high-occupancy toll (HOT) lanes, or exclusive or special use lanes. Each of these concepts offers unique benefits; therefore, careful consideration is given to project goals and objectives in choosing an appropriate lane management strategy or combination of strategies. Project goals may include increasing transit use, providing choices to the traveler, or generating revenue.
Manual Lane	A toll lane wherein a Toll Service Attendant is present to accept cash, token or ticket as toll payment from a Customer.
Mixed Use Lane	A toll lane in which different kinds of means of payments are accepted (e.g. card-based and electronic toll transactions).
Memorandum of Understanding (MoU)	A document that expresses mutual agreement on an issue between two or more parties.
Metropolitan Planning Organizations (MPO)	Are responsible for transportation planning in metropolitan areas
Multiprotocol Technology	Bridges the interoperability gap between diverse RFID technologies used for electronic toll collection and other ITS applications such as Automatic Equipment Identification and Electronic Vehicle Registration.
O	
Occupancy	The portion of time where a point or short road section is occupied by one or more vehicles or persons.

TERM (ACRONYM)	DESCRIPTION/DEFINITION
On-Board Transponder	Also called a transponder, tag and On-Board Unit. The in-vehicle device component of a DSRC (or ETC) system. A receiver or transceiver permitting the Operator's Roadside-Unit (RSU) to communicate with, identify and conduct an electronic toll transaction.
On-Board Unit (OBU)	The in-vehicle device component of a DSRC (or ETC) system. A receiver or transceiver permitting the Operator's Roadside Unit (RSU) to communicate with, identify and conduct an electronic toll transaction; also called a 'transponder' or 'tag.'
Open Barrier Systems	Differ throughout the industry but often are designed to have toll barriers across the mainline plazas, but do not have ramp toll barriers on all of the interchanges, typically allowing some local traffic movements toll-free.
Open Road Tolling (ORT) System	An electronic Toll Collection System without toll plazas, where drivers will get charged the toll without having to stop, slow down, or stay in a given lane.
Operations and Maintenance (O&M)	This department is responsible for operating and for maintaining the tollways.
Operator	An entity that manages the functions of a tolled facility, parking lot, etc.
Optical Character Recognition (OCR)	Hardware and software system capable of recognizing alphanumerical characters.
P	
Priced Managed Lanes	See "Managed Lanes"
Public / Private Partnership (PPP or P3)	Is a government service or private business venture funded and operated through a partnership of government and one or more private sector companies. A PPP involves a contract between a public sector authority and a private party, in which the private party provides a public service or project and assumes substantial financial, technical and operational risk in the project.
R	
Reconciliation	The process by which the back-office is used to adjudicate conflicts in transaction data (e.g. the difference between an Automatic/Automated Vehicle Classification (AVC)-determined vehicle class and the customer's pre-programmed tag class) and establish the toll amount to be deducted from the customer's account.
Registered Toll Customer	A toll facility user who has enrolled in either an RFID tag or "pay by plate" program.
Responsive Pricing	Pricing that is intended to change consumption patterns.

TERM (ACRONYM)	DESCRIPTION/DEFINITION
Radio Frequency Identification (RFID)	Is the wireless contactless use of radio-frequency electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. The tags contain electronically stored information. Some tags are powered by and read at short ranges (a few meters) via magnetic fields (electromagnetic induction). Others use a local power source such as a battery, or else have no battery but collect energy from the interrogating EM field, and then act as a passive transponder to emit microwaves or UHF radio waves.
Road Pricing	Also called Value Pricing. A system by which congestion and improved roadways can be managed through different levels of toll rates at peak and non-peak hours.
Roadside Unit (RSU)	The roadside infrastructure component of an ETC system; a receiver or transceiver that identifies the On-Board Unit in the vehicle and identifies the account, permitting an electronic toll transaction to occur. Also called a 'reader,' or 'beacon.'
Roadside Equipment (RSE)	Roadside devices that are used to send messages to, and receive messages from, nearby vehicles using Dedicated Short Range Communications (DSRC) or other alternative wireless communications technologies.
S	
Safe Accountable Flexible Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)	Is U.S. federal transportation legislation, enacted Aug. 2005, which provided for funding and directions to support the federal-aid highway program.
Smart Card	A small plastic card embedded with a memory chip and often a microprocessor, used for financial transactions, identification, as a key, etc.
Sticker	Or vignette proving that a distance or time-related toll has been paid by a user.
SunPass	Electronic toll collection system used in Florida.
T	
Tag	Also known as an On-Board Unit and Transponder. The in-vehicle device component of a DSRC (or ETC) system. A receiver or transceiver permitting the Operator's Road-side Unit (RSU) to communicate with, identify and conduct an electronic toll transaction.
Telematics	Technologies in automotive communications, combining wireless voice and data capability for management information and safety applications.

TERM (ACRONYM)	DESCRIPTION/DEFINITION
Ticket Systems	Require each driver to stop and pick up a ticket upon entry and then stop and relinquish the ticket and pay the toll upon exit. The concept of ticket systems can be extended to that of an “electronic ticket” as determined by electronic sensors located in entry and exit lanes, parking lots, etc.
Toll	A fee charged by a toll facility operator in an amount set by the operator for the privilege of traveling on said toll facility.
Toll Collection System	The combination of elements and components that constitute the means to collect a fee for use of a tolled facility.
Toll Lane	Restricts traffic flow to facilitate either the automatic or manual collection of tolls.
Toll Plaza	An area, with restricted traffic flow, where tolls are collected from drivers, either manually or electronically.
Toll Receipt	Receipt given to customer while in the toll lane that can show amount paid, date, time, lane, Toll Service Attendant and vehicle classification. The concept of a toll receipt may be extended to that of a monthly statement listing all toll transactions for that period.
Toll Service Attendant (TSA)	An employee of an operator or other entity who is assigned the duty of collecting tolls from toll facility customers.
Transaction	A time-framed event occurring in the toll lane representing either a cash or electronic toll. The transaction is identified by all or a combination of the following parameters; location, time, date, vehicle class, vehicle ID, toll amount, etc.
Transponder	The in-vehicle device component of a DSRC (or ETC) system. A receiver or transceiver permitting the Operator's Road-Side Unit to communicate with, identify and conduct an electronic toll transaction. Also called On-Board Unit and Tag.
Transportation Research Board (TRB)	Provides leadership in transportation innovation and progress through research and information exchange, conducted within a setting that is objective, interdisciplinary and multimodal. TRB is one of six major divisions of the (US) National Research Council— a private, nonprofit institution that is the principal operating agency of the National Academies in providing services to the government, the public, and the scientific and engineering communities. The National Research Council is jointly administered by the National Academy of Sciences, the National Academy of Engineering and the Institute of Medicine.
Turnpike	In the U.S.A.: toll road

TERM (ACRONYM)	DESCRIPTION/DEFINITION
U	
Urban Road Pricing	Also called road user charges (RUC), urban road pricing consists of direct charges levied for the use of roads, including tolls, distance or time based fees, congestion charges and charges designed to discourage use of certain classes of vehicle, fuel sources or more polluting vehicles. These charges may be used primarily for revenue generation, usually for road infrastructure financing, or as a transportation demand management tool to reduce peak hour travel and associated traffic congestion or other social/environmental externalities associated with road travel such as air pollution, greenhouse gas emissions, visual intrusion, noise and road accidents.
United States Department of Transportation (U.S. DOT)	Is a federal Cabinet department of the U.S. government concerned with transportation.
User	Any driver driving on a Toll Facility. The User is the holder of an account and On-Board Unit. The User may use the On-Board Unit to pay for tolls or services. In toll collection terms the User may be referred to as the "motorist".
User Charge	Payment of a given sum of money that allows the use of a service for a certain time period.
V	
Value Pricing	See also Road Pricing. A system by which congestion and improved roadways can be managed through different levels of toll rates at peak and non-peak hours.
Violation Enforcement System (VES)	The collective equipment and procedures that capture a violation transaction, image and the citation process.
Video Billing	A billing system using video images of a vehicle's license plate to identify the customer responsible for toll payment.
Violation	A record of an unpaid toll which occurs when a customer does not pay the proper amount.
Violation Camera	Camera located at each toll lane that takes pictures of violation events. Image capture contains, at minimum, human or Optical Character Recognition (OCR) readable pictures of the front, rear or both license plates.
Violation Processing Center (VPC)	A place where violation processing systems and/or human reviewers work on reviewing and processing violations through the system.

TERM (ACRONYM)	DESCRIPTION/DEFINITION
Vehicle Miles of Travel (VMT)	The sum of all the miles traveled by vehicles (not people) in a specified amount of time

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APPENDIX B: IBTTA's 2015 Report on Tolling in the United States

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IBTTA

TOLLING. MOVING SMARTER.

2015 REPORT ON TOLLING IN THE UNITED STATES

TOLLING IS AN IMPORTANT FEATURE OF THE US TRANSPORTATION LANDSCAPE.

FAST FACTS

35

Number of US states and territories with at least one tolled highway, bridge or tunnel (Source: IBTTA, 2014)

$13 billion

Toll revenues collected by US toll agencies in 2013. (Source: IBTTA, based on publicly available data, 2015)

5.7 billion

Number of trips per year on tolled roads and crossings in the United States (Source: IBTTA, 2015)

5,932

Miles of US toll roads (Source: Federal Highway Administration, 2013)

$14 billion

Capital investment over three years by the top 40 US toll facilities operators (Source: IBTTA Toll Industry Survey, 2011)

3x higher

Fatality rate on all US roads (1.47 per 100 million vehicle miles traveled) versus all toll facilities (0.50) (Source: IBTTA study, 2008)

37 million

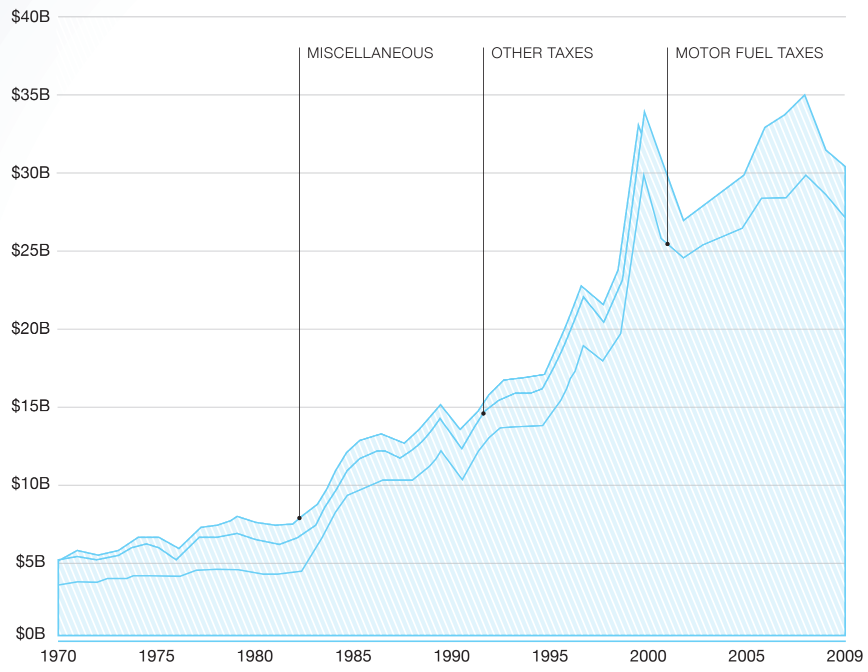
Number of transponders being used for electronic tolling in the US (Source: IBTTA, 2014)

84

Percentage of Americans who feel tolls should be considered as a primary source of transportation revenue or on a project-by-project basis. (Source: HNTB Corporation survey, 2010)

Revenues from the federal fuel tax are declining.

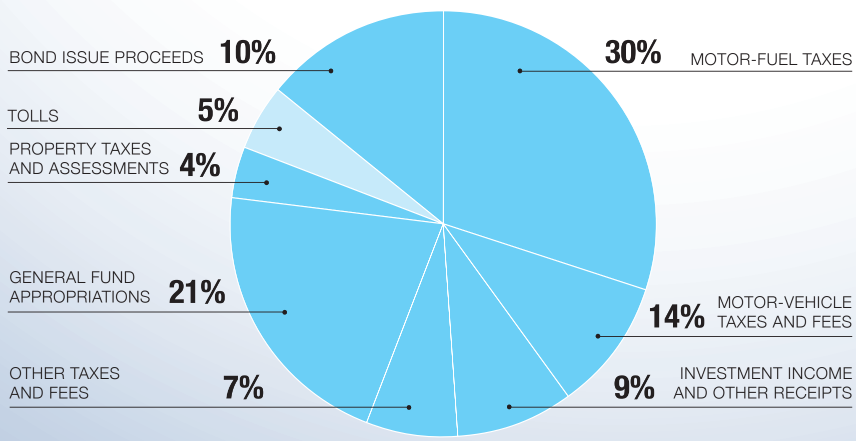
HIGHWAY TRUST FUND RECEIPTS: 1970 - 2009



SOURCE: FEDERAL HIGHWAY ADMINISTRATION

Tolls represent 5% of highway revenues and growing.

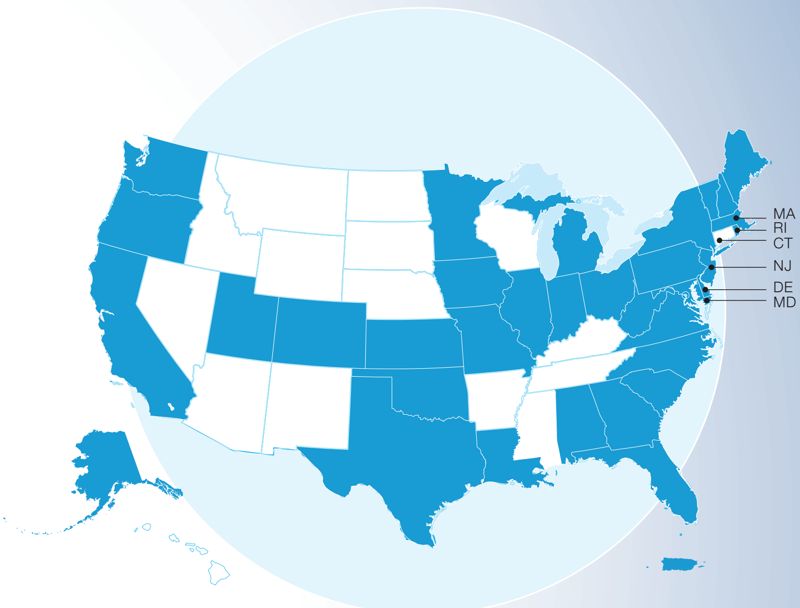
HIGHWAY REVENUE BREAKDOWN



SOURCE: FEDERAL HIGHWAY ADMINISTRATION, 2011

STATES WITH TOLL ROADS

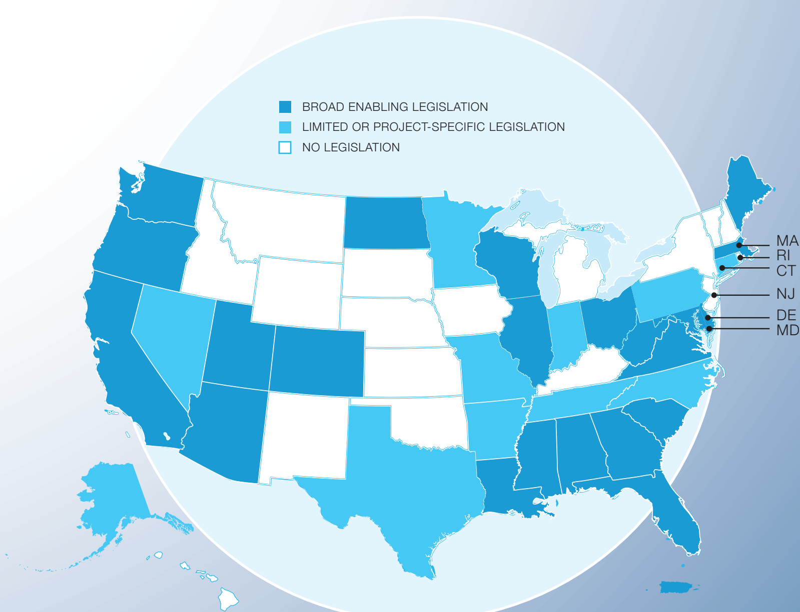
Thirty-four states and Puerto Rico have toll roads and crossings...



SOURCE: IBTTA

STATES WITH PUBLIC-PRIVATE PARTNERSHIPS

...And 33 states and Puerto Rico support public-private partnerships in highway finance.



SOURCE: NATIONAL CONFERENCE OF STATE LEGISLATURES

TOP 10 TOLL AGENCIES

BY MILEAGE

1	OKLAHOMA TURNPIKE AUTHORITY	605
2	FLORIDA'S TURNPIKE ENTERPRISE	594
3	NEW YORK STATE THRUWAY AUTHORITY	570
4	PENNSYLVANIA TURNPIKE COMMISSION	554
5	NEW JERSEY TURNPIKE AUTHORITY	321
6	ILLINOIS TOLLWAY	286
7	OHIO TURNPIKE AND INFRASTRUCTURE COMMISSION	241
8	KANSAS TURNPIKE AUTHORITY	236
9	ITR CONCESSION COMPANY LLC: INDIANA TOLL ROAD CONCESSIONAIRE	157
10	MARYLAND TRANSPORTATION AUTHORITY	146

BY REVENUE IN MILLIONS - US$

1	NEW JERSEY TURNPIKE AUTHORITY	1,413
2	THE PORT AUTHORITY OF NEW YORK & NEW JERSEY	1,330
3	MTA BRIDGES AND TUNNELS	1,227
4	ILLINOIS TOLLWAY	943
5	PENNSYLVANIA TURNPIKE COMMISSION	812
6	FLORIDA'S TURNPIKE ENTERPRISE	756
7	BAY AREA TOLL AUTHORITY, METROPOLITAN TRANSPORTATION COMMISSION	670
8	NEW YORK STATE THRUWAY AUTHORITY	649
9	NORTH TEXAS TOLLWAY AUTHORITY	572
10	HARRIS COUNTY TOLL ROAD AUTHORITY	560

SOURCE: IBTTA, 2013

TOLLING PROVIDES ANSWERS TO AMERICA'S TRANSPORTATION NEEDS.

Q: WHY DO WE NEED TOLLS TO PAY FOR ROADS AND CROSSINGS?

A: No matter how you slice it, federal and state fuel taxes are insufficient to support America's highway infrastructure. Tolls provide a valuable source of revenue both to build new roads and maintain existing roads.

Q: HOW DO TOLLS BENEFIT THE AVERAGE AMERICAN?

A: The primary benefits are better, safer roads; less congestion; more predictable trip times and reduced need for taxes to pay for roads. Tolls provide money today for projects that can be built in the near future and meet demand for decades to come. If it were not for tolls, many of the best roads and bridges in the US might never have been built.

Q: ISN'T A TOLL JUST ANOTHER TAX?

A: No, tolls are voluntary user fees. Drivers can choose to pay tolls or take alternate routes, whereas taxes are mandatory and charged to everyone. Yes, customers of toll facilities also pay taxes, but the taxes are used to fund non-toll roads. Since toll roads are primarily self-financed and do not rely on taxes, the customer is not paying twice for the facility. In fact, without tolls, taxes would be higher.

Q: WHAT ABOUT PUBLIC OPPOSITION TO THE IDEA OF NEW TOLLS?

A: Revenue-raising measures are never popular, especially in a time of economic stress. The federal fuel tax has not been raised since 1993. However, numerous toll facilities have been approved in the anti-tax environment of recent decades, and opinion polls consistently show that motorists prefer tolls over taxes and support the expansion of toll roads to improve driver options and travel times.[1] In one poll, 84 percent of Americans said tolls should be considered as a primary source of transportation revenue or on a project-by-project basis.[2]

Q: DOES TOLLING SLOW THE FLOW OF TRAFFIC?

A: Toll roads tend to be less congested than tax-funded roads, where unrestricted access often leads to congestion. Toll roads also lead to time savings and congestion relief on nearby roadways by increasing the total road capacity available. Moreover, with today's technology, most toll operators are eliminating toll plazas and expanding their high-speed, automated tolling options. Most new facilities are being built as cashless systems, with no stopping or slowing down to pay a toll.

MILESTONES IN OPEN ROAD TOLLING AND INTEROPERABILITY

1984

Multi-lane, free flow Urban Road Pricing demonstrated in Hong Kong (predecessor to Singapore and started concept of road user charging).

1987

Alesund, Norway

The world's first electronic toll system.

1989

Early ETC Adopters –
First U.S. installations of ETC seen by Crescent City Connection (formerly the Greater New Orleans Bridge), Oklahoma Turnpike Authority and Dallas North Tollway.

1990

Portugal ETC System "Via Verde" Implemented

The E-ZPass Interagency Group (IAG) forms with three states (New York, New Jersey & Pennsylvania) and seven agencies.

1991

The **E-470 Public Highway Authority** opens as one of the first non-stop, high-speed ETC lanes in the United States.

First Open Road Tolling demonstrated as feasible — **Newcastle University, UK** by Professor Peter Hills using Saab Combitech (now Kapsch) DSRC tags.

Q: HOW DO TOLL ROADS COMPARE TO NON-TOLLED ROADS IN TERMS OF SAFETY?

A: Toll roads are generally safer than non-tolled roads due to better maintenance, pavement, and technology. Toll operators employ state-of-the-art technology to monitor road conditions and have a financial incentive to keep their roads running as safely and smoothly as possible. The facts bear this out, as toll facilities in the United States have a much lower fatality rate than US roads overall.[3]

Q: IS TOLLING FAIR TO LOW-INCOME MOTORISTS?

A: Many surveys have shown that drivers of all income levels use tolled facilities and support having the option to use high-quality toll roads. A well-designed pricing plan can be less burdensome to low-income citizens than systems that are based on regressive taxes, such as car registration fees, sales taxes and the gasoline tax.

Q: WON'T TOLLS INCREASE CONSUMER PRICES BY DRIVING UP THE COST OF TRUCKING?

A: The poor state of our roads and bridges is already raising consumer prices through congestion, lost time and higher operating costs for trucking companies. The most recent Urban Mobility Report by the Texas Transportation Institute found that highway congestion cost the United States $101 billion in 2010 and will rise to $133 billion by 2015.[4] By increasing the quality of infrastructure and easing congestion, tolls can produce cost savings for truckers and all consumers.

1993

Georgia 400 and Oklahoma Turnpike Sites of the first express high-speed electronic toll collection systems in the United States.

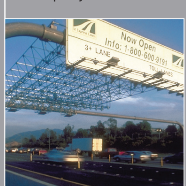
1995

First EZ-Pass Interoperability between NYSTA and NJTA

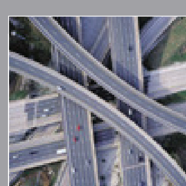
Portugal becomes first country to apply a single, universal system to all tolls in the country, the **Via Verde**, which can also be used in parking lots and gas stations.

First E-ZPass Interoperability between NYSTA and MTA Bridges & Tunnels.

State Route 91 in Orange County, California Opened first All-Electronic Toll Collection and High Occupancy Toll (HOT) lanes in the country in 1995.



1997



Toronto, Canada's 407 ETR The world's first all-electronic, barrier-free toll highway opens.

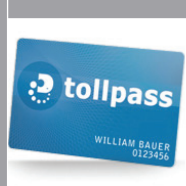
1998

Singapore opens the world's first urban-area electronic road pricing system using smart cards.

Express Lanes at Toll Plazas Many agencies across the US begin converting existing toll plazas to incorporate high-speed express lanes.

1999

First SmartCard based ETC System



2000

CityLink a 22-kilometer automated tollway in **Melbourne, Australia** opens.

2001

Switzerland Nationwide LSVA/ORT truck tolling system launches operation.

Q: WHAT ABOUT THE AIR POLLUTION CAUSED BY VEHICLES IDLING AT TOLL PLAZAS?

A: Stop-and-start traffic stemming from extreme congestion is an even greater contributor to air pollution, and it can be partially addressed through increased use of toll-based congestion pricing. Meanwhile, most toll agencies are moving toward "open road tolling," which eliminates toll plazas.

In one study by the Central Texas Regional Mobility Authority, which compared vehicle emissions on a toll road with those on a parallel tax-funded road, emissions of various air pollutants were 28 percent to 56 percent lower on the toll road, in part because of a 75 percent improvement in travel times and 26 percent reduction in fuel consumption.[5]

Q: SOME STATES WANT TO PUT TOLLS ON INTERSTATE HIGHWAYS. WHY SHOULD WE ALLOW TOLLS ON ROADS THAT ARE ALREADY PAID FOR?

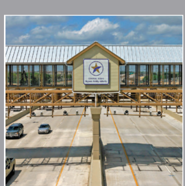
A: "Already paid for" misses the point. America's interstate highway system is aging and will deteriorate over time without substantial new investment. The future cost to rebuild these roads will be much higher than the original cost. Federal and state fuel taxes are already insufficient to maintain the interstates in good repair, much less rebuild them. Tolling is a proven, convenient, fair way to raise revenues to rebuild these highways.

Q: WOULD INCREASED USE OF TOLLING CREATE POLITICAL DIVISIONS BETWEEN STATES THAT DO AND DON'T HAVE TOLL ROADS?

A: No. Neither tolls nor taxes are the solution for every transportation finance and funding issue. Each state will meet its transportation needs with its own mix of financing techniques, including tolls, taxes and borrowing. With other sources of revenue in decline and transportation needs increasing, many states and localities are looking to tolls as an efficient option with many benefits.

Q. WHAT ARE "CONCESSIONS," AND WHAT ROLE DO PRIVATE BUSINESSES PLAY IN TOLLING?

A. A concession is a contract between a government entity and a private enterprise (frequently a consortium) to build or rebuild a tolled road, bridge



2002

North Texas Tollway Authority
Nation's first system wide conversion of toll plazas to include express electronic toll collection lanes in 2002.

2003

London Congestion Charging Program begins based on Video License Plate Reading.

2004

Austrian DSRC National Truck Tolling

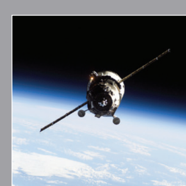
New Jersey Turnpike Authority First to offer five side-by-side express lanes for highway speed Electronic Toll Collection in 2004.

Trans Israel Highway opens with open road electronic toll system.

ASFINAG introduces national heavy vehicle electronic tolling system in Austria.

Autopista Central in Santiago, Chile opens the first urban all electronic open road tolling facility in Chile soon to be followed by four other all electronic and interoperable open road tolling facilities in the city.

Westpark Tollway opens as All-Electronic Toll Road in **Houston** (**Harris County** Toll Road Authority).



2005

Distance based charge for trucks on motorways in Germany. Nation-wide open road tolling system; the world's first example of a toll system based on use of GPS satellites and GSM communications.

2006

Launch of NORTIS
Multi-country interoperability of toll systems in Scandinavian countries (EasyGo service).

Tampa Hillsborough Selmon Expressway opens the first All-Electronic reversible roadway (Cross-town elevated express lanes).

or tunnel and assume its day-to-day operations for a stated period of time. This is frequently referred to as a "public-private partnership" or P3. The private entity may provide the funds for the infrastructure improvement, or make payments to the government in return for what amounts to a long-term lease on the tolled facility. Ownership of the facility always remains public. The private company takes on the challenge of building and operating a facility that provides enough benefits to drivers that they will willingly choose to use the facility and pay the tolls needed to repay the construction and operational costs.

P3s are regulated by state law and require enabling legislation. Currently, 33 states and Puerto Rico (see page 3) allow P3s, which are viewed as an attractive option for bringing private investment into the transportation system to help offset shortfalls in governmental resources. Concessions are very common in Europe and are being used with increasing frequency in the United States.

DEFINITIONS

TOLL: A fee charged by the operator of a highway, bridge or tunnel for the use of that facility.

VEHICLE MILES TRAVELED (VMT): 1) The total number of miles driven by all vehicles within a given time period and geographic area; 2) the number of miles driven per person per day.

ELECTRONIC TOLL COLLECTION (ETC): The collection of tolls based on automatic identification of vehicles using electronic systems. An ETC lane collects tolls with no stops required, and an Express Lane allows vehicles to pass at highway speeds.

HOT LANES: High Occupancy Toll lanes are High Occupancy Vehicle (HOV) lanes that also allow access to low occupancy vehicles if drivers pay a toll, allowing more vehicles to use HOV lanes while raising revenue and keeping an incentive for shifting travel times and modes.

OPEN ROAD TOLLING: An electronic toll collection system without toll plazas, in which drivers are charged without having to stop, slow down or stay in a given lane.

CONGESTION PRICING: Harnessing market forces to reduce traffic congestion by charging higher tolls at peak travel times. Removing even a small fraction of vehicles on a congested road allows the system to flow much more efficiently.

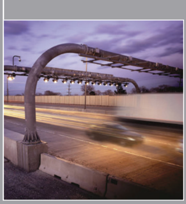
TRANSPONDER: In-vehicle equipment permitting a toll facility operator to identify and conduct an electronic toll transaction with a driver.

For more definitions, visit IBTTA's glossary at www.IBTTA.org/glossary

2007

Alliance for Toll Interoperability forms with initial member agencies.

All-Electronic Toll Conversion Projects Initial Wave of converting existing toll roads to AETC starts in earnest.



Miami-Dade Expressway Authority (MDX) opens the Dolphin Extension in June 2007 becoming the first all-electronic stretch of roadway in South Florida.

2009

E-470 Public Highway Authority ends cash toll collection on July 4, 2009. All customers use the 70 mph express lanes.

2010

Miami-Dade Expressway Authority (MDX) fully converts the Gratigny, Don Shula and Snapper Creek expressways to Open Road Tolling. The three roadways became the first toll roads in South Florida to go cashless and all-electronic.

2011

Florida's Turnpike Enterprise converts 47 miles of the Turnpike in Miami-Dade County to all-electronic tolling.

THE NATION'S ECONOMY DEPENDS ON A STRONG TRANSPORTATION SYSTEM. BUT THAT SYSTEM IS IN CRISIS BECAUSE OF A LACK OF FUNDING, DETERIORATING INFRASTRUCTURE AND GROWING CONGESTION.

- Tolling is a fair, sustainable and smart way to fund, develop and operate roads.
- Because they have a dedicated funding source, toll roads typically are safer, better maintained and have more predictable travel times than non-tolled roads.
- The growth of all-electronic tolling means it is easier to establish toll roads now than ever before.

IBTTA members are leaders in providing safe, economical and customer-friendly roads, bridges and tunnels.

LEARN MORE...

WEB: **www.IBTTA.org**
TWITTER: @IBTTA or #TollRoads
BLOG: www.IBTTA.org/blog
FACEBOOK: International, Bridge, Tunnel & Turnpike

TOLLING. MOVING SMARTER.

ABOUT IBTTA

The International Bridge, Tunnel and Turnpike Association (IBTTA) is the worldwide association for the owners and operators of toll facilities and the businesses that serve them. Founded in 1932, IBTTA has members in more than 20 countries on six continents. Through advocacy, thought leadership and education, members are implementing state-of-the-art, innovative user-based transportation financing solutions to address the critical infrastructure challenges of the 21st century.

CONTACT IBTTA

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ENDNOTES

1 Transportation Research Board, 2008
2 Survey sponsored by HNTB Corporation, 2010
3 Tollways, 2008
4 Texas Transportation Institute study, 2011
5 Central Texas Regional Mobility Authority, 2009

OTHER RESOURCES

- IBTTA: www.IBTTA.org/maf
- OmniAir Consortium: www.omniair.org
- Alliance for Toll Interoperability (ATI): www.tollinterop.org
- Federal Highway Administration: www.fhwa.dot.gov

APPENDIX C: HNTB's THINK Whitepaper: Leveraging tolls in the 21st century

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THINK®
INFRASTRUCTURE SOLUTIONS

HNTB

Leveraging tolls in the 21st century

Large projects routinely use tolls to fund a portion of their costs, but the full value of user-based financing continues long after construction is completed and the initial debt has been paid.

WHITE PAPER | JANUARY 2015

Tolls are fast becoming a fact of life for delivering transportation infrastructure projects, whether they are publically financed or public-private partnerships. But, as many owners are discovering, tolls also can be long-term revenue engines, powering decades of maintenance and operations, system improvements and other critical transportation projects in growing metro areas.

In this white paper:

- The national movement to tolling.
- Why tolls remain relevant long after the initial construction is financed.
- Top staying-power strategies: How to ensure tolling for the long-term.

Tolling is this century's funding solution of choice

Tolling is becoming the 21st century solution of choice for generating additional user-based transportation revenue. The proven funding source is being seriously considered for expanded use by cities, states and even the federal government with support from elected officials across the political spectrum. In fact, with each federal transportation reauthorization, tolling restrictions have been relaxed:

- SAFETEA-LU (2005) created four toll demonstration programs to finance interstate construction and reconstruction, promote efficiency in the use of highways and reduce congestion:
  1. The Interstate System Reconstruction & Rehabilitation Toll Pilot Program
  2. The Interstate System Construction Toll Pilot Program
  3. The Value Pricing Pilot Program
  4. The Express Lanes Demonstration Program
- MAP-21 (2012) allows tolling of newly constructed lanes added to existing toll-free Interstate highways and tolling for new construction of bridges and tunnels on the interstate system.
- President Obama's proposed GROW AMERICA Act (2014) would allow tolling on interstate highway general-purpose lanes.

Other indications that tolling is here to stay:

- Annual toll revenues have more than doubled to $13 billion in the past decade.
- Today, there are 121 public toll entities in the United States that operate nearly 340 tolled facilities. Of those, 19 are new toll agencies, formed in the past decade, and 17 are state departments of transportation.
- Total mileage on tolled highways has increased by 11 percent in the past decade.
- States, such as Florida and Texas, evaluate all new projects as tolled.

In short, tolling is fast becoming a fact of life in the United States. Most new mega transportation projects — whether public-private partnerships or publically financed — now have tolling components:

- While tolling isn't a prerequisite for P3s, many owners are using tolling as a way to make these projects a reality. Nearly 86 percent (18 of 21) of greenfield P3 projects since 2007 have a tolling component.
- And, the majority of recently financed public projects have a tolling component, including New York's Tappan Zee Bridge, Texas' Grand Parkway, California's SR91 and Kentucky's Downtown Crossing.

Tolling finances system and capital improvements after the initial construction is paid

Most of the major turnpikes created in the 1950s paid off their original debt in the mid-1980s. But none of those agencies removed tolls. Why? Toll agencies recognized the importance of the systems they built and how those systems could be leveraged to build new projects or subsidize existing modes:

- After extensive evaluation of transportation needs and funding, **Ohio** decided to leverage its Turnpike in 2014 by increasing tolls and issuing $1.5 billion for 10 new transportation projects that include widening portions of Interstate 75 and replacing the Innerbelt Bridge.
- When its bonds were retired in the 1980s, the **Florida** Legislature considered removing all tolls from the Turnpike System. After extensive study, the Legislature decided to pass legislation in 1990 to leverage Florida's Turnpike to expand its system. The toll rates were doubled, more than $1 billion generated and nine Turnpike-candidate projects were authorized. In the 20 years following the legislation, more than 140 miles have been added to Florida's Turnpike System. The Turnpike does not rely on federal or state funding.
- The North **Texas** Tollway Authority built $5 billion of additional projects from toll revenues.
- **New York's** Metropolitan Transportation Authority uses tolls from its tunnels and bridges to subsidize its subway system.

While a small number of facilities have removed tolls in the last 30 years, most were smaller single-asset facilities or bridges without much opportunity for future expansion and upkeep.

Although rare, when decisions to remove tolls are issued, they are politically motivated or made automatically after the initial debt is retired. However, the common argument for eliminating tolls is if the revenue being generated doesn't cover the facility's operating and maintenance expenses, as was the case with Florida's Navarre Bridge in 2004. Still, operating and maintenance expenses must come from some funding source. If only partially paying costs, toll revenues still decrease the need to tap tax funds. In nearly every instance, a stronger case can be made for keeping tolls than for eliminating them.

Agencies develop strong rationales for continuing tolls

Below are talking points agencies have used to effectively disarm common arguments for toll removal:

"THE BONDS HAVE BEEN RETIRED. THE FACILITY IS PAID FOR."

- If the next federal reauthorization grants states even more tolling authority, any agency that forgoes its tolls will have lost its back office and its tolling expertise at a time when they are needed most.
- Entities that have removed tolls now are struggling for maintenance and capacity improvement funding due to limited DOT funding.
- Connecticut removed tolls from its Turnpike in 1985 and is now considering reinstating them.
- If the majority of toll revenue comes from out-of-state customers, eliminating tolls doesn't make sense. It leaves citizens paying for all of the upkeep and maintenance of the facility while the bulk of users ride for free!
- Close one facility and remaining facilities in a system will be forced to shoulder a higher financial portion of the shared back office and overhead costs. Covering these additional costs may leave them unable to pay their own operating and maintenance expenses. Before tolls were removed from the Georgia 400, the facility funded the majority of the toll operations for Georgia's State Road and Tollway Authority (SRTA). Not only did eliminating tolls leave a hole in SRTA's operations budget, the proposed 285/400 interchange potentially could have benefited from the revenues generated, had the Georgia 400 toll remained. The removal of tolls has been followed by an increase in traffic volumes and, therefore, potentially greater congestion.
- There is a physical cost to toll removal. Owners don't switch off the system and walk away.

"I PROMISED VOTERS I WOULD REMOVE TOLLS IF ELECTED."

- At current interest rates, $1 in annual toll revenues can produce approximately $17 in upfront bond proceeds. Removing tolls means the state is killing a potential revenue stream that could be used to bond other projects. When the Dallas-Fort Worth Turnpike (I-30) removed tolls in 1977, officials eliminated a critical revenue stream that, consequently, delayed additional capacity improvements on the corridor by approximately 35 years. One official admitted, albeit many years later, that removing the tolls from the Dallas-Fort Worth Turnpike was the worst decision he had ever made.
- Eliminating tolls means eliminating a capital program that creates jobs.
- Removing tolls reduces the opportunity for future funding partnerships.
- It limits opportunities for a regional system or a multiasset, statewide financing approach.

"IT'S A BARRIER TO ATTRACTING NEW BUSINESSES."

- Many states have toll roads and, for them, tolling is good for economic development:
  - In the Dallas/Fort Worth area, State Farm Insurance is moving its regional headquarters (8,000 employees) to Richardson and the intersection of President George Bush Turnpike and Plano Road.
  - Toyota's North American headquarters is moving to Plano, Texas, at the corner of the Dallas North Tollway and the Sam Rayburn Tollway.
  - Commercial development and warehousing is springing up around the New Jersey Turnpike Authority's recently completed Interchange 6 to 9 Widening Program.

"WE DON'T NEED TO PAY MORE TAXES!"

- Referring to a toll as a "tax" is not accurate. It's better to describe the toll as a user fee. Taxes are paid by all, user fees are paid only by users.
- Without tolls, taxes likely would be higher!
- There are no "free" roads. Roads are paid for with taxes or user fees.

Best practices help position tolling for posterity

Most toll agencies continue to issue debt to refinance, upgrade and expand their facilities to meet present and future customer demands.

Ensuring tolls remain for the benefit and mobility of future generations begins with frequent, open, communication that targets two important audiences:

1. **Customers.** Messages of increased safety, higher maintenance standards, funding for new capacity and other enhancements make a strong argument for tolling. When customers know their dollars are being spent to improve the facility and their safety, they generally approve of long-term tolling.

   Debt incurred in the interest of providing better customer service and safer facilities is a buffer in itself. Tolls are not typically stripped away from facilities that have outstanding financial obligations. It would be difficult for another entity to pay off or take over the debt in the absence of toll revenue. However, debt should be used only to help fund needed projects in a capital plan.

2. **Elected officials.** If elected officials can tell your story for you when their constituents start asking questions, your agency will be ahead of the game. Strong legislative ties are invaluable to safeguarding tolls' longevity.

As the initial bonds are retired, agencies should be ready with an effective, proactive communications plan that educates elected officials and customers about how tolls will be used *after* the debt is paid.

Tolling offers near- and long-term benefits

Tolling is becoming more commonplace — not only for its capacity to deliver large, near-term transportation infrastructure projects that keep our country moving, but for its long-term stamina. Leveraging tolls in the 21st century means seeing this user-based revenue for what it truly is — a financing power tool that continues to produce long after initial construction and the initial debt has been paid.

Resources

For information, please contact one of HNTB's toll experts:

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