ELECTRONIC PAYMENT AND PRICING

MANAGEMENT AND OPERATIONS

Electronic payment systems employ various communication and electronic technologies to facilitate commerce between travelers and transportation agencies.

Electronic toll collection (ETC) systems support the collection and processing of toll plaza transactions without requiring the driver to stop and pay manually, increasing operational efficiency and convenience for tollway travelers. ETC systems operate as either integrated multi-state systems such as the E-ZPass system, or single-state or single toll authority systems such as the Oklahoma Turnpike system. ETC can reduce fuel consumption and emissions at toll booths by minimizing delays, queuing, and idling time.

Transit fare payment systems can provide increased convenience to customers and generate significant cost savings to transportation agencies by increasing the efficiency of cash-handling processes and improving administrative controls. Public transportation users can select from a variety of fare products such as magnetic stripe cards (read-only or read-write), smart cards with varying levels of memory and computing power, or use credit cards to pay for transportation services.[397] Fare transaction machines can read and write to multiple types of media and fare products, and regional processing centers can consolidate financial information and streamline fare transaction management for multiple transit agencies. Billing systems supporting transit fare payment can be used in the coordination of human service transportation, linking the reservation system to a payment system that tracks billing to different mobility programs depending on client eligibility.

Electronic parking fee payment systems can provide similar benefits to parking facility operators, simplifying payment for customers and reducing congestion at parking facilities.

Multi-use payment systems can make transit payment more convenient. Payment for bus, rail, and other public- or private-sector goods and services can be made simply by passing a smart-card-sized device over an automated transaction processor located at terminal gates, on-board bus fareboxes, or check-out counters of participating merchants. Fare transaction processors access information on smart cards and communicate account activity to a regional database. Centralized systems can track the location and activity of smart cards and limit unauthorized use of individual accounts. In addition, merchants who provide convenient access to smart card processors can be identified and receive special incentives for promoting use of transit services.

Congestion pricing, also known as road pricing or value pricing, refers to charging motorists a fee that varies with the level of congestion. Value pricing reflects the idea that road pricing directly benefits motorists through reduced congestion and improved roadways. To eliminate additional congestion, most pricing schemes are set up electronically to offer a more reliable trip time without creating additional delay. Pricing is different from tolling in that pricing strategies are used to manage congestion or demand for highway travel, while tolling is used to generate revenue to repay a bond or debt.

There are four main types of congestion pricing strategies:[398]

- Variable priced lanes including express toll lanes and high-occupancy toll (HOT) lanes.
- Variable tolls on entire roadways or roadway segments, i.e., changing flat toll rates. on existing toll roads to variable rates based on congestion levels.
- Cordon charge, i.e., charging a fee to enter or drive in a congested area.
- Area-wide charge including distance-based charging or mileage fees.

The arterial management and freeway management chapters discuss pricing on these particular types of facilities, as a lane management technique.

NEARLY ALL (95 PERCENT) OF TOLL PLAZAS IN MAJOR METROPOLITAN AREAS ARE EQUIPPED WITH ELECTRONIC TOLL COLLECTION.

ELECTRONIC PAYMENT AND PRICING CATEGORIES IN THE ITS KNOWLEDGE RESOURCES

Toll Collection

Transit Fare Payment

Parking Fee Payment

Multi-use Payment

Pricing

OTHER ITS KNOWLEDGE RESOURCE CATEGORIES RELATED TO ELECTRONIC PAYMENT AND PRICING

Arterial Management

Lane Management: Pricing

Freeway Management

Lane Management: Pricing

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The electronic payment and pricing applications profiled in this chapter, particularly variable tolling and congestion pricing, are a key element of the U.S. DOT's Congestion Initiative, as outlined in the May 2006 document *National Strategy to Reduce Congestion on America's Transportation Network*. A major component of the Congestion Initiative is the Urban Partnership Agreement program, through which the U.S. DOT plans to partner with selected metropolitan areas to demonstrate strategies with proven effectiveness in reducing traffic congestion.[399]

Under the Urban Partnership Agreement, the U.S. DOT and its partners have agreed to demonstrate some combination of the following four strategies with a combined track record of effectiveness in reducing traffic congestion, collectively referred to as the "Four Ts:"

- Tolling—Implementing broad congestion pricing or variable tolling demonstrations.
- Transit—Creating or expanding express bus services or bus rapid transit (BRT), which will benefit from the free-flow traffic conditions generated by congestion pricing or variable tolling.
- Telecommuting—Securing agreements from major area employers to establish or expand telecommuting and flexible scheduling programs.
- Technology and operations—Utilizing cutting edge technological and operational approaches to improve system performance.

For more information, visit the Congestion Initiative Web site: *www.fightgridlocknow.gov*.

Findings

Benefits

ETC and variable pricing strategies help transportation agencies address traffic congestion.

ETC is one of the most successful ITS applications with numerous benefits related to delay reductions, improved throughput, and fuel economy. With advanced technologies such as open road tolling (ORT), toll transactions can be processed automatically at freeway speeds reducing the need for tollbooth barriers and improving performance. Concepts of ORT can be incorporated into new toll plaza designs or constructed at existing plazas that currently have speed-controlled, dedicated ETC lanes.

On freeways, variable pricing strategies are effective at influencing traveler behavior. In rural areas with little congestion, research shows that approximately 20 percent of motorists will modify their travel schedules to take advantage of off-peak toll discounts.[400] In urban areas, however, where heavy congestion and extended peak periods are typical; demand management strategies may require large toll differentials.[401] Although initial public support for such tolls may be low, research indicates that road users value time savings and are willing to pay a price to avoid congestion and delay.[402] In California, for example, public support for variable tolling on State Route 91 was initially low, but after 18 months of operations, nearly 75 percent of the commuting public expressed approval of virtually all aspects of the Express Lanes program.[403]

Other pricing strategies such as cordon charging are also effective. In London, congestion charging remains politically sensitive, but evaluations have shown that the pricing program has been effective at reducing congestion and generating revenue for transit improvements.

Table 11 illustrates that electronic payment and pricing strategies have had significant impact under many of the ITS goal areas. Electronic toll collection is a proven technology that greatly reduced toll plaza delays, with corresponding improvements in capacity, agency cost savings, and fuel consumption reductions. Transit fare payments can provide similar mobility improvements for transit travelers by simplifying the boarding experience, improving customer satisfaction, and making it easier to take advantage of transit services. Parking and multi-use payment cards have been well received by travelers in several implementations. Congestion pricing strategies, as discussed above, have shown improvements in mobility, productivity, fuel consumption, and customer satisfaction.

Table 11—Electronic Payment and Pricing Benefits Summary

	Safety	Mobility	Efficiency	Productivity	Energy and Environment	Customer Satisfaction
Toll Collection	✱	●	●	●	●	
Transit Fare Payment		●	●			●
Parking Fee Payment				✚		●
Multi-Use Payment						●
Pricing		●		●	●	✚

● Substantial positive impacts ✚ Positive impacts
❍ Negligible impacts ✱ Mixed results
✖ Negative impacts **blank** Not enough data

Costs

The Federal Highway Administration (FHWA) initiated a study to explore the benefits and costs of fully deploying operational strategies and integrating ITS in metropolitan areas. Seattle, Cincinnati, and Tucson were selected as large, medium, and small metropolitan areas, respectively. Strategies included for Seattle and Cincinnati were based on 2003 traffic conditions while those for Tucson were based on forecast traffic conditions for 2025. The analysis considered a 25 year period. The annual costs to implement, operate, and maintain each system were adjusted to 2003 dollars. One of the strategies identified was electronic transit fare payment. For each of the three metropolitan areas, deployment (the number of transit vehicles) and proportional coverage (the percentage of fixed-route transit vehicles) were identified. The annualized life cycle costs for electronic transit fare payment systems were estimated at $5.9 million for Seattle, $2.4 million for Cincinnati, and $1.1 million for Tucson.[404] See sample costs of ITS deployments in the tables below for more specific examples of other electronic payment and pricing systems.

A STUDY OF THE CONGESTION CHARGING SCHEME IN CENTRAL LONDON FOUND BENEFITS EXCEEDING COSTS BY A RATIO OF 1.5:1 FOR A £5 CHARGE AND 1.7:1 FOR AN £8 CHARGE.

Benefit-Cost Studies

A benefit-cost analysis of the central London congestion charging scheme suggests that the identified benefits exceeded the costs of operations by a ratio of around 1.5:1 with an £5 charge, and by a ratio of 1.7:1 with an £8 charge[405].

Deployment

Figure 16 shows deployment trends for two forms of electronic payment—toll collection and transit fare payment—based on a multi-year survey of the country's 78 largest metropolitan areas from 2000 to 2006. ETC is nearly universal, with more than 90 percent of toll plazas and more than 80 percent of toll lanes in the 78 metropolitan areas equipped with ETC. Many transit agencies as well are offering customers the option of electronic payment. Customers can pay with magnetic card readers on more than 60 percent of transit buses in these 78 metropolitan areas and pay with "smart cards" on nearly one-third of transit buses in these 78 metropolitan areas.

In 2006, the survey of metropolitan areas was expanded to the country's 108 largest metropolitan areas. This survey is the source of deployment statistics presented later in this chapter.

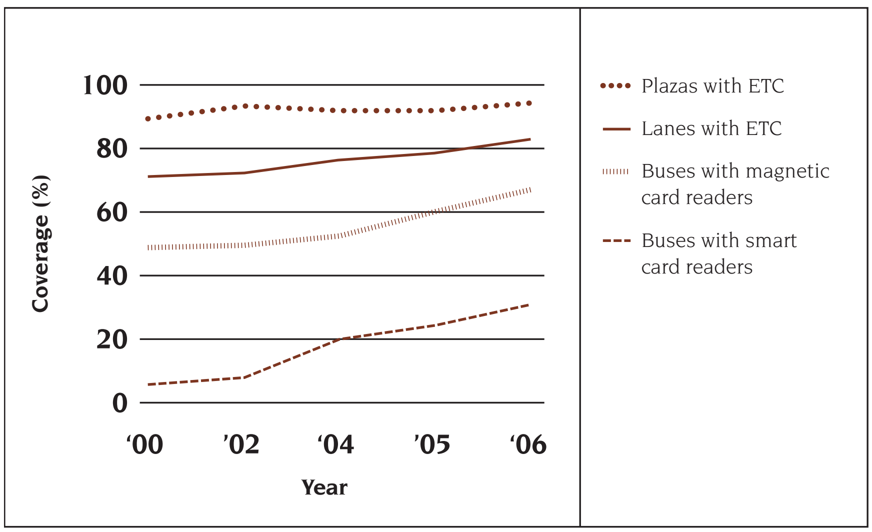

Figure 16 – Deployment Trends for Electronic Toll Collection and Fare Payment, 2000-2006

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Selected Highlights from the ITS Knowledge Resources on Electronic Payment and Pricing

Toll Collection

ETC supports the collection of payment at toll plazas using automated systems to increase the operational efficiency and convenience of toll collection. Systems typically consist of vehicle-mounted transponders identified by readers located in dedicated and/or mixed-use lanes at toll plazas.

Toll Collection	
Deployment	
ETC is nearly universal in major metropolitan areas. Ninety-five (95) percent of toll plazas in the country's 108 largest metropolitan areas are equipped with ETC.	
Benefits	
ITS Goals	**Selected Findings**
Safety	In Florida, the addition of ORT to an existing ETC mainline toll plaza decreased crashes by an estimated 22 to 26 percent.[406] An earlier experience in Florida found that driver uncertainty about toll plaza configuration and traffic speeds contributed to a 48 percent increase in crashes at plazas with traditional ETC lanes.[407]
Mobility	In Florida, the addition of ORT to an existing ETC mainline toll plaza decreased delay by 50 percent for manual cash customers and by 55 percent for automatic coin machine customers, and increased speed by 57 percent in the express lanes.[408]
Efficiency	On the Tappan Zee Bridge toll plaza in New York City, a manual toll lane can accommodate 400 to 450 vehicles per hour, while an electronic lane peaks at 1,000 vehicles per hour.[409]
Productivity	On the Oklahoma Turnpike, the cost to operate an ETC lane is approximately 91 percent less than the cost to staff a traditional toll lane.[410]
Energy and Environment	An evaluation of ETC at three major toll plazas outside Baltimore, Maryland indicated these systems can reduce environmentally harmful emissions by 16 to 63 percent.[411]

LESSONS LEARNED

Consider open road tolling to increase mobility at toll facilities.

Open road tolling is the collection of tolls by purely electronic means using gantry-based electronic tolling and enforcement systems. ORT provides the technological approach to enabling the use of pricing for traffic management without requiring vehicles to stop and pay a toll. In most existing charging schemes, vehicles are identified via a transponder. Vehicles without a transponder are identified by a video image of the license plate, which is then checked against a record of electronic toll collection account holders or vehicles registered by drivers who have paid a toll over the telephone or Internet. License plates that cannot be reconciled to an account and have not registered can be charged a premium fee using the auto registration to send an invoice, or are identified as violators and processed accordingly.

(*Continued on next page.*)

Toll Collection
Costs
Unit Costs Data Examples (See Appendix A for more detail)
Toll Plaza subsystem: • Electronic Toll Reader: $2K-$5K • High-Speed Camera: $7K-$10K Toll Administration subsystem: • Toll Administration Hardware: $5.9K-$8.8K • Toll Administration Software: $38K-$76K Roadside Telecommunication subsystem: • Conduit Design and Installation—Corridor: $50K-$75K (per mile) • Fiber Optic Cable Installation: $20K-$52K (per mile)
Sample Costs of ITS Deployments
Florida: To provide expanded mobility, the Miami-Dade Expressway Authority will convert toll operations to ORT during 2007 through 2011. The authority owns and operates a network of five expressway segments, which cover 31 centerline miles, in metropolitan Miami. The ORT program capital cost is estimated at **$56.5 million**: **$20.8 million** for project development, public outreach, and system-wide technology development (e.g., back office processing), and **$35.7 million** for infrastructure and roadside technology along the five expressway segments. The fiber optic backbone needed to connect the roadside equipment to the host location will be provided by others; hence, the associated cost is not included in the above estimate.[412] **California:** Four managed lanes are being planned along 26 miles of the I-5 North Coast in San Diego County. The project includes seven ETC sites, seven direct access ramps from local streets, and designated slip ramps providing access between the managed lanes and the general purpose lanes. The preliminary cost estimate for ETC (roadside equipment, structures, communication interface, and system tracking) on the managed lanes is **$1.7 million** which includes a 30-percent contingency.[413]

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Transit Fare Payment

Electronic transit fare payment systems, often enabled by smart card or magnetic stripe technologies, can provide increased convenience to customers and generate significant cost savings to transportation agencies by increasing the efficiency of money handling processes and improving administrative controls.

Transit Fare Payment	
Deployment	
Nearly two-thirds (64 percent) of fixed-route transit buses in the country's 108 largest metropolitan areas are equipped with magnetic stripe readers and 31 percent of fixed-route transit buses in these 108 metropolitan areas are equipped with "smart cards."	
Benefits	
ITS Goals	**Selected Findings**
Mobility	***Summary Finding:*** Proof-of-payment systems that use ticket vending/validating machines can reduce boarding times by up to 38 percent.[415]
Efficiency	In the Puget Sound region of Washington, a fare payment integration system that used joint passes to allow base fares to be transferred between agencies increased the percentage of riders that made transfers from 41 percent in 2001 to 60 percent in 2004.[416]
Customer Satisfaction	A Chicago Transit Authority survey of smart card users found that features related to convenience, rail use, and speed were most liked by program participants; 21 percent rated convenience over the magnetic stripe card as their single favorite feature of the system. The most desired features were the multi-use functions and ability to recharge the smart card via the Internet and credit card.[417]

LESSONS LEARNED

(*Continued from previous page.*)

- In Toronto on Highway 407, non-registered autos can use the electronically tolled highway, but are charged a hefty premium. Trucks, however, have to have a transponder and if not are considered violators.

ORT represents a significant technical jump compared to traditional tolling systems. From an operational point of view, the handling of violators and control of operational costs need to be carefully addressed. While using ORT can reduce costs associated with manual toll collection, the reduction in labor costs might be somewhat offset by the increase in need for image-based transactions and violation processing.[414]

Transit Fare Payment
Costs
Unit Costs Data Examples (See Appendix A for more detail)
Transit Management subsystem: • Upgrade for Automated Scheduling, Run Cutting, or Fare Payment: $19K-$38K • Integration for Automated Scheduling, Run Cutting, or Fare Payment: $214K-$476K • Further Software Upgrade for E-Fare Payment: $38K-$57 Transit Vehicle On-Board subsystem: • Electronic Farebox: $0.6K-$1.1K
Sample Costs of ITS Deployments
Massachusetts: The Silver Line Waterfront Rapid Transit service represents a new branch of BRT to the South Boston waterfront and Logan International Airport. The Silver Line is being implemented in three phases. For Phase II, the Massachusetts Bay Transportation Authority installed two fare vending machines—one full service and one cashless—at each of the airport terminal stops. The total cost of the deployment was **$1.26 million**. Full service machines cost **$35,494 each** and cashless machines cost **$23,420 each**. Construction and installation costs totaled **$275,000**; infrastructure was an additional $**593,000**.[418] **Washington D.C. Metropolitan Area:** The Northern Virginia Transportation Commission worked closely with the Washington Metropolitan Area Transit Authority (WMATA) to develop a Regional Software Maintenance Agreement. This agreement protects and ensures the participation of smaller transit agencies in the Regional SmarTrip® Rollout. Prior to the agreement, the smaller agencies were expected to pay $70,000 per year to maintain their fare collection systems. For many this amount was almost as much as the total farebox revenues. Under the agreement, smaller agencies will spend **$30,000 per year** for the first two years, and approximately **$23,000 per year** thereafter. Software support, trouble-shooting, updates, and technical support are included under the agreement.[419] **Worldwide:** Costs data were obtained from various BRT projects, either underway or planned, and made available to transit professionals and policy makers in planning and decision making related to implementing different components of BRT systems. The data are representative of BRT development costs. On-board smart card fare collection systems typically cost approximately **$20,000 per vehicle** and off-board smart card media systems cost around **$65,000 per machine**.[420] **New Mexico:** Building on the success of Client Referral, Ridership, and Financial Tracking (CRRAFT), the Alliance for Transportation Institute developed a plan and implemented smart card technology—the Intelligent, Coordinated Transit Smart Card Technology Project (ICTransit Card)—to provide cost-effective, seamless, and convenient transportation services in a rural setting. The cost of the ICTransit Card system was approximately **$635,700**.[421] Operating costs for the ICTransit Card system are about **$93,000 each year** with about **$40,000** shared with the annual operations for CRRAFT.[422]

Parking Fee Payment

Electronic parking fee payment systems can provide benefits to parking facility operators, simplify payment for customers, and reduce congestion at parking facility entrances and exits. These payment systems can be enabled by any of a variety of technologies including magnetic stripe cards, smart cards, in-vehicle transponders, or vehicle-mounted bar codes.

<table>
<tr><th colspan="2">Parking Fee Payment</th></tr>
<tr><th colspan="2">Deployment</th></tr>
<tr><td colspan="2">Electronic payment systems at parking facilities are in use in 25 of the country's 108 largest metropolitan areas.</td></tr>
<tr><th colspan="2">Benefits</th></tr>
<tr><td>ITS Goals</td><td>Selected Findings</td></tr>
<tr><td>Productivity</td><td>At the end of June 2004, the Washington, D.C. region Metrorail service required that contactless electronic payment cards be used to pay for parking at all Metrorail stations. In the following 2 months, purchases of the cards increased from 8,000 per month to 75,000 per month.[423]</td></tr>
<tr><td>Customer Satisfaction</td><td>In the Washington, D.C. region, contactless electronic payment cards used to pay both parking fees and subway fares were considered easy to use by over 97 percent of card holders surveyed. Usefulness of the cards was rated at 4.85 on a scale of 1 (low) to 5 (high).[424]</td></tr>
<tr><th colspan="2">Costs</th></tr>
<tr><td colspan="2">Unit Costs Data Examples (See Appendix A for more detail)</td></tr>
<tr><td colspan="2">Transit Management subsystem:
• Integration for Auto. Scheduling, Run Cutting, or Fare Payment: $219K-$486K
Parking Management subsystem:
• Entrance/Exit Ramp Meters: $2K-$K4
• Tag Readers: $2K-$4K
• Database and Software for Billing & Pricing: $10K-$15K
• Parking Monitoring System: $19K-$41K</td></tr>
<tr><td colspan="2">Sample Costs of ITS Deployments</td></tr>
<tr><td colspan="2">Washington, D.C.: WMATA expanded the capability of its SmarTrip® contactless smart card system by linking it to multiple bus and rail fare collection systems throughout the Washington, D.C. area. Since its introduction in early 1999, the SmarTrip® card has achieved significant market penetration for use in the WMATA Metrorail system and associated parking facilities. A Regional Customer Service Center performs cross-jurisdictional management, distribution, and reconciliation tasks. The cost of the center includes contracted services, a central database, a point-of-sale network and devices, and existing system software upgrades. Total capital cost: $25.537 million (2002-2003). Operations and maintenance (O&M) cost: $3.45 million per year (2002-2003).[425]</td></tr>
</table>

Multi-Use Payment

Multi-use payment systems can make transit payment more convenient. Payment for bus, rail, and other public- or private-sector goods and services can be made using transit fare cards at terminal gates, or at check-out counters of participating merchants located near transit stations. Multi-use systems may also incorporate the ability to pay highway tolls with the same card.

Multi-Use Payment	
Deployment	
Multi-use payment systems that can be used to pay for both transit fares and tolls are in use in 15 of the country's 108 largest metropolitan areas.	
Benefits	
ITS Goals	**Selected Findings**
Customer Satisfaction	In Central Florida, smart cards designed to work with transit, parking, and ETC systems were evaluated during a field operational test. Focus group participants indicated that the card provided convenience and improved their transportation experience.[426]
Costs	
Unit Costs Data Examples (See Appendix A for more detail)	
Transit Management subsystem: • Upgrade for Automated Scheduling, Run Cutting, or Fare Payment: $19K-$39K • Integration for Automated Scheduling, Run Cutting, or Fare Payment: $219K-$486K • Further Software Upgrade for E-Fare Payment: $39K-$58K Transit Vehicle On-Board subsystem: • Electronic Farebox: $0.6K-$1.2K	

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Pricing

Congestion pricing, also known as road pricing or value pricing, employs the use of technologies to vary the cost to use a transportation facility or network based on demand or the time of day. Pricing strategies include: variable priced lanes, variable tolls on entire roadways or roadway segments, cordon charging, area-wide charging, and fast and intertwined regular lanes.

Pricing	
Deployment	
Congestion pricing remains uncommon in major metropolitan areas according to a 2006 survey. Only 3 of the country's 108 largest metropolitan areas (Chicago, Denver, and New York) employ congestion pricing on their freeways, and only 1 (Los Angeles) employs congestion pricing on arterial streets.	
Benefits	
ITS Goals	**Selected Findings**
Mobility	On the New Jersey Turnpike, E-ZPass participation and variable tolling were projected to decrease peak period traffic congestion at urban interchanges by 15 to 20 percent and have minimal impacts on non-turnpike diversion routes.[427] In London, congestion pricing (cordon charging) decreased inner city traffic congestion by about 20 percent.[428]
Productivity	Congestion mitigating benefits of cordon charging in London enabled taxi drivers to cover more miles per hour, service more riders, and decrease operating costs per passenger-mile.[429]
Energy and Environment	Congestion charging in London led to reductions in emmisions of 8 percent in oxides of nitrogen, 7 percent in airborn particulate matter, and 16 percent in carbon dioxide when compared to data from 2002 and 2003 prior to the introduction of congestion charging.[430]
Customer Satisfaction	In Minneapolis, Minnesota, survey data collected prior to the deployment of MnPASS Express Lanes (HOT lanes) on I-394 were examined to determine travelers' willingness-to-pay to avoid congestion. The results indicated that 59 percent of travelers would pay $2 to save 20 minutes; 40 percent would pay $2 to save 15 minutes; 23 percent would pay $2 to save 10 minutes; and less than 10 percent would pay $2 to save 5 minutes. Willingness-to-pay also decreased as toll rates increased. Virtually no one was willing to pay more than $6 for any amount of time savings.[431]

LESSONS LEARNED

Consider various toll schemes to push traffic demand away from peak periods.

The advent of electronic toll collection has provided new tools for traffic management. Manual toll collection's inherent limitations did not provide the flexibility required to use pricing as a means to manage traffic. As a result, there are now a variety of toll schemes that may be employed to distribute traffic flow more evenly throughout the day.

- Implement time-of-day tolling as a means to push traffic demand away from peak periods.

Toll rates are fixed by time of day and day of week, usually at one-hour intervals. Peak prices on weekdays are generally highest and pricing is adjusted typically every few weeks based on hourly volumes. Setting prices based on time of day is relatively simple to implement from a technology perspective. When rate schedules are published, this approach is easy for the driving public to understand, but it does not offer the flexibility of other methods in updating the toll rates.

- Consider dynamic pricing, based on current conditions, to shift traffic demand.

Dynamic pricing adds a level of traffic management sophistication over time-of-day tolling. With dynamic pricing, tolls are based on actual traffic conditions, changing to maximize some specific objective such as speed, volume, traffic density, or travel time.[434]

Pricing
Costs
Unit Costs Data Examples (See Appendix A for more detail)
Roadside Detection subsystem: • Inductive Loop Surveillance on Corridor: $3K-$8K Roadside Control subsystem: • Fixed Lane Signal: $5K-$6K Roadside Information subsystem: • Dynamic Message Sign: $48K-$119K Transportation Management Center subsystem: • Hardware, Software for Traffic Surveillance: $131K-$160K • Integration for Traffic Surveillance: $219K-$267K • Software for Traffic Information Dissemination: $17K-$21K • Integration for Traffic Information Dissemination: $83K-$101K Toll Plaza subsystem: • Electronic Toll Reader: $2K-$5K • High-Speed Camera: $7K-$10K Toll Administration subsystem: • Toll Administration Hardware: $5.4K-$8.1K • Toll Administration Software: $39K-$78K Roadside Telecommunications subsystem: • Conduit Design and Installation—Corridor: $50K-$75K (per mile) • Fiber Optic Cable Installation: $20K-$52K (per mile)

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Pricing
Costs
Sample Costs of ITS Deployments
Georgia: In 2005, the Georgia State Road and Tollway Authority received a grant through the FHWA Value Pricing Pilot Program to investigate the application of value pricing to the high-occupancy vehicle (HOV)/BRT project along the I-75/I-575 corridors. The project entailed 26 miles, 9 points of access to the managed lanes, tolling equipment, and a back office system. Cost estimates of operational concepts for converting HOV lanes to managed lanes on I-75/I-575 ranged from **$20.9 million to $23.7 million**. Both plans assumed that tolls would be levied based on distance traveled. During the more congested periods higher toll rates (per mile rate) would be in effect, with lower per mile tolls in effect during lesser congested periods. The toll schedule would vary, but the pricing scheme would be fixed. HOVs were assumed to travel in the managed lanes at no charge.[432] **London:** Congestion charging in London improves efficiency, reduces pollution, and raises revenue for transit improvements. Championed by the Mayor of London, the program requires motorists to pay a fee of £8 per day to drive within the inner city of London on workdays between 7:00 AM and 6:30 PM. Enforcement is achieved using a network of fixed and mobile video cameras that record images of vehicles in the congestion charging zone. Optical character recognition technology and automatic number plate recognition computer systems interpret and decipher the license plate numbers and map them against a pay list. If the system shows a payment is outstanding, the image is checked manually to confirm the vehicle make and model matches the license registration before a penalty is issued. Images of vehicles in good standing are removed from the system. O&M costs are estimated at **£92 million per year**.[433]

LESSONS LEARNED

Include high-occupancy toll lanes to alleviate peak period congestion.

High-occupancy toll lane facilities charge single-occupancy vehicles (SOV) for the use of a high-occupancy vehicle lane. Access into the HOT lane remains free for transit vehicles, vanpools, and carpools. The toll charged for SOVs is dynamically adjusted to ensure traffic congestion does not exceed an established threshold for all vehicles in the HOV lanes. Toll collection is performed electronically to provide non-stop toll collection. Tolls are charged at fixed points along the facility.

As peak period congestion continues to be a problem throughout the United States, agencies are looking towards tolling technologies as a mitigation technique. Varying tolls based on the time of day and/or current traffic conditions allows agencies to shift traffic demand away from normal peak periods, resulting in a more effective traffic management process. The advent of HOT lane facilities provides the option for drivers willing to pay a premium to experience less congested travel, creating better traffic distribution across road networks.[435]

389 *Emergency Response Management System Study*, Prepared by Traffic Engineers, Inc. for the Houston Metropolitan Transit Authority. Houston, TX. April 1991. Benefits ID: 2002-00227

390 *Evaluation of Emergency Vehicle Signal Preemption on the Route 7 Virginia Corridor*. U.S. DOT Federal Highway Administration, Report No. FHWA-RD-99-070. July 1999. Benefits ID: 2000-00125

391 *Rural ITS Toolbox*, U.S. DOT Federal Highway Administration, Report No. FHWA-OP-01-030, EDL No. 13477. November 2001. Costs ID: 2003-00018

392 *Managing Demand Through Travel Information Services*, Prepared for the U.S. DOT Federal Highway Administration, Report No. FHWA-HOP-05-005, EDL No. 14072. 2005. Benefits ID: 2007-00409

393 "An Operational Analysis of the Hampton Roads Hurricane Evacuation Traffic Control Plan," Paper Presented at the 86th Annual Meeting of the Transportation Research Board. Washington, DC. 21–25 January 2007. Benefits ID: 2008-00547

394 *A Study of the Impact of Nine Transportation Management Projects on Hurricane Evacuation Preparedness*, U.S. DOT Federal Highway Administration, EDL No. 13940. November 2003. Lesson ID: 2005-00138

395 Cortelazzi, Lou, et al. *Pennsylvania Turnpike Commission's Advanced Traveler Information System (ATIS) Phase III Project*, Pennsylvania Turnpike Commission, EDL No. 14308. April 2006. Costs ID: 2008-00168

396 David Lively, M.A. David and Osama Elhamshary. *Lessons Learned From Advanced Traveler Information Systems: Applications for Emergency Management and Long Term Disaster Recovery*, California DOT. April 2004. Lesson ID: 2006-00316

397 *Advanced Public Transportation Systems: State of the Art Update 2006*, U.S. DOT Federal Transit Administration, Report No. FTA-NJ-26-7062-06.1. 30 March 2006.

398 *Congestion Pricing—A Primer Report*, U.S. DOT Federal Highway Administration, Report No. FHWA-HOP-07-074. December 2006.

399 "National Strategy to Reduce Congestion," U.S. DOT Web site URL www.fightgridlocknow.gov. Last Accessed 29 February 2008.

400 Burris, Mark and Ashley Yelds. "Using ETC to Provide Variable Tolling: Some Real-World Results," Paper Presented at the 10th ITS America Annual Meeting, Boston, MA. 1–4 May 2000. Benefits ID: 2000-00168

401 *Pennsylvania Turnpike Value Pricing Study*, Prepared by Wilbur Smith Associates for the Pennsylvania Turnpike Commission, Executive Summary, Pages ES-5 and ES-6. March 2004. Benefits ID: 2008-00548

402 Sources that support these findings:

2005 *Regional Value Pricing Corridor Evaluation and Feasibility Study: Dallas/Fort Worth—Value Pricing History and Experience*, North Central Texas Council of Governments. Arlington, TX. June 2005. Benefits ID: 2008-00549

Douma, Frank, Johanna Zmud, and Tyler Patterson. "Pricing Comes to Minnesota: Baseline Attitudinal Evaluation of the I-394 HOT Lane Project," Paper Presented at the 85th Transportation Research Board Annual Meeting. Washington, DC. 22–26 January 2006. Benefits ID: 2008-00550

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