

# Proceedings of the National Road Pricing Conference

June 2-4, 2010, Houston, Texas

Sponsored by  
Federal Highway Administration  
Transportation Research Board

The National Road Pricing Conference brought together transportation policy makers and practitioners who are interested in pursuing pricing projects in their communities. The conference featured:

- a technical tour of managed lanes in Houston;
- experts discussing well-known national road pricing projects; and
- an interactive workshop for discussing all aspects of high-occupancy toll (HOT)-lane implementation, from beginning to post ribbon cutting.

HOT lane, managed lane, and variably-priced toll facility specialists offered lessons learned from successfully-applied road pricing strategies in the U.S. Topics that were covered include:

- planning and development of pricing projects;
- outreach and public acceptance;
- financial aspects of project development; and
- design, operations and enforcement.

This report provides a description of the panel presentations and discussions on June 3<sup>rd</sup> and 4th. Presentations can be accessed at the conference web site:

<http://tti.tamu.edu/conferences/nrp10/program/>

## WELCOME AND OPENING REMARKS

### *Bob Arnold, Federal Highway Administration*

I would like to open the conference with a discussion about what the future for transportation might look like. The first example is what car makers thought future cars would look like. The GM Firebird 3, was designed with the future in mind. It was driven by jet engines and did not have a steering wheel but a control stick like in a jet plane. This was a real working car that went about 100 mph. There was even a promotional video that depicted an air traffic control like system for ground cars. Instead of a fast, jet powered car, we have SmartCars with a three

cylinder engine and Global Positioning Systems (GPS) that to some is just a “magic black box” that shows us where to go.

When looking at the future, people tend to project what exists now into a future space. In order to think of what will happen in the future, people need a whole new way to project out into the future. We won't capture the future looking at today's technologies and systems then projecting forward. We have to look forward (not at what is going on right now) to see something that changes the world. It may not be a product that changes the way transportation is achieved; it may be a social change.

Adam Smith in his book “The Wealth of Nations” had a premise of the “division of labor” which stated that it would affect productivity. Transportation allows us to create this division of labor in things like manufacturing and even the entertainment business. Due to this division of labor, jobs can be scattered and elements produced at the most efficient manner; then brought together for final assembly. But this premise goes beyond manufacturing, as an example you do not find amusement parks in every city because people can drive to them. This has created fewer but larger amusement parks and businesses providing an economy of scale.

Another thought I had was on the emerging topic of livability and sustainability. So what are the definitions of livability and sustainability? I look at it like a Monet painting. “It's pretty, but it's not quite sharp.” There is a need to sharpen up these definitions to make them understandable. I keep changing the definitions until I finally finds the correct ones that everyone agrees.

Livability: “when I get to where I'm going, I'm not agitated.” The drive was a pleasant and fruitful experience. Sustainability: “all externalities have been included in the decision making and the cost of the trip.” When I'm 80 years old, I can afford to get where I'm going. These definitions must be understood by transportation professionals but they should be definitions that the public will also understand and embrace.

I've calculated the cost of owning my vehicle at 28.7 cents per mile with 1.25cents of that being the user fee or gas tax. This is about 4 percent of the cost of running the vehicle. Since the basic cost of using the road is a very small portion of operating my vehicle any alternative method of collection beyond at the pump will have to have a low administrative cost to be effective in raising revenue or the public will just see it as bureaucratic inefficiency not contributing to providing better transportation. Unfortunately, some of the current schemes have a high administrative cost, some in excess of 2 cents per mile; however this is just projecting our current technology into the future.

Lastly I'd like to tell a little story, when I first started working my wife asked “what do you do?” When I started to explain she quickly became bored and told me that she just wanted me to “make my car fold up like a briefcase”, similar to what George Jetson had in the cartoon. Years later when I got my position in Washington DC she asked how the fold-up car was going. I told my wife that she already had a briefcase sized transportation because she had a laptop. A laptop can be put in your briefcase. I suggest that a laptop is a means of transportation much like a car

because you can go to work, shop, get an education with online courses, and even go sightseeing on it. A laptop remotely lets you conveniently do actions you would normally have to get into a car and go out to do. Now you can see out into the world without leaving home.

Futurists just projected out what they already had, cars. They did not know that the transistor or the microchip would occur. Nor did they dream of the worldwide internet for worldwide communication. That is what transformed the concept of a fold-up car into a laptop.

***Delvin Dennis, Texas Department of Transportation, Houston District***

Many took advantage of technical tours yesterday on I-10 and US 290. The tour went on I-10 first which is Houston's most recent major construction effort. The second part was on the US 290 HOV lane to go west. The HOV lane moved during the tour but often times it does not move. Ginger Goodin suggested that if she had to do it over again, she would have taken the tour on US 290 first to show what I-10 used to look like.

The I-10 construction cost several billion dollars. The project reconstructed 23 miles of interstate highway, added general capacity lanes and added four lanes of managed traffic, which are called the managed lanes. Here in Houston, managed lanes are the code name for toll. Key to I-10 was the added capacity in general use lanes, as well as the four added managed lanes. The project opened in October of 2008 and has been steadily ramping up. People at first were afraid to get in the managed lanes but more and more people are using them each month.

Harris County Tollroad Authority (HCTRA) operates and maintains the facility that is technically in a TxDOT right-of-way. Harris County collects the tolls and keeps the revenue. HCTRA purchased this privilege for \$237.5 million dollars in an agreement that was brokered 7-8 years ago.

The problem with this type of project is that it can be researched over and over and sometimes you just have to put it on the ground and see how it works. So now that the managed lanes have been implemented, they have been found to be working in Houston, Texas.

The managed lanes in Houston were developed through a partnership between TxDOT, Houston METRO and HCTRA (under Harris County). Houston can be a researcher's dream or nightmare. So far, Houston hasn't shied away from trying something new. Currently, Dallas – Ft. Worth has a very robust program that Houston is watching but the situation was reversed 6-7 year ago.

The biggest challenge in transportation right now is funding. We all know it. I was in a legislative briefing with congressmen and senators the day before and it was about the lack of funding for the US 290 project.

US 290 is Houston's next mega-project which will:

- Cost around \$4.6 billion.
- Add general purpose capacity.
- Relocate the HOV lane and managed lanes to Hempstead Highway which runs parallel to US 290. These lanes would be owned and operated by HCTRA.
- Create high capacity transit element (commuter rail) on the existing Union Pacific (UP) corridor. UP is interested in discussions of sharing the right-of-way. UP discussions will probably be long but they are at the table.

Currently, the Dallas-Fort Worth area has a lot of different things going on: LBJ, North Tarrant Expressway (NTE), Public Private Partnerships (PPP), toll roads and managed lanes. On paper the NTE will offer an HOV in-line declaration lane and there will be a peak period 50 percent discount. Well, all of this looks neat on paper, but I want to see how they will sign it, how it will work and I advise the DFW area that the first three weeks will be horrible (confusing for motorists).

In reference to Mr. Arnold's funding slide: Houston in general, is trying to catch up with public transportation. Houston realizes that it can never build itself out of congestion, so we will have to look at smarter ways to control congestion. While looking at these new opportunities, the most important thing is to make sure to educate the public and elected leaders.

Mr. Dennis provided the following calculation:

State gas tax: \$.020 a gallon

Federal gas tax: \$0.184

Drive a car that gets 20 miles to the gallon

Drive 20,000 miles per year

You would buy 1,000 gallons of gas in year.

You only pay \$384 in tax a year. \$32 a month. \$1 a day.

Some people think that's a lot. Well what do you pay for your cell phone bill in a month? I pay a lot more than that. Cable? More. Transportation is taken for granted. Drivers expect to pull out in the morning and have a decent facility to drive on, in a reliable manner that is maintained and so far transportation authorities have always provided that. Going forward it is going to get harder as funding is slim. The gas tax is a broken funding system. Congressmen do not expect anything to come out of congress until at least next year. Congress has added almost \$35 million to the highway fund from the general fund to keep it from going broke. Someone will have to figure a new way to fund our highways.

## SESSION 1

### **The Case for Congestion Pricing — Is Revenue Generation in Conflict with Traffic Management?**

**Moderator:** *David Ungemah, Parsons Brinckerhoff*

#### HOT 2.0

HOT lanes previously came from under-utilized HOV lanes but now there are not as many available. The need now is to maximize efficiency and expand capacity.

The first part of the conference is going to be on the possible conflicts between revenue generation and pricing as a strategy for congestion management and traffic management. Currently, toll pricing seems to offer an opportunity for reducing congestion.

Revenue generation versus traffic management seem to be the big issue right now. Yet, this issue doesn't seem to apply to toll roads. When does it apply? This issue doesn't seem to apply to new toll facilities that need the revenue to pay back the cost of construction. The issue seems to present itself when HOT lanes and toll lanes are being introduced. The concept of HOT lanes has been controversial because it converts an existing HOV lane to a toll lane. The first conversion of HOV to HOT came on I-15, which was also the first HOT lane project to have an extension.

The first HOT lane conversions were the result of many "low hanging fruit" opportunities which were HOV lanes that had excess capacity. These conversions came at a low cost and were quick implementations. These low hanging fruit opportunities are dwindling which has moved us to find new HOT lane opportunities, which I call the HOT 2.0. HOT 1.0 was geared towards maximizing effectiveness, encouraging new HOV growth and optimizing capacity on the corridor. The HOV users were unregulated with traffic management being relatively low on these facilities. HOT 2.0 is geared toward maximizing overall corridor efficiency. For example, the I-10 expansion looked at the entire corridor maximization, not just the HOT lanes. The I-10 HOT project targeted capacity expansion, created new capacity, looked to optimize return on investment (ROI) from the expansion of capacity and provided regulation of all vehicles to the facility not just toll (primarily SOV).

How can HOVs be priced or managed? PPPs will be a big part of that. The private sector needs to be brought in on policy making, not just in construction. Policy making can have a mix of strategies to enable HOT 2.0 without HOV users losing benefits of the facility. Going forward the transportation agencies will be viewed as a customer to the private sector because the transportation agencies will be enabling discounts for HOVs or allowing for accessibility for

HOV users which will allow them to regulate access. The agencies will have to consider the design, the configuration and access restrictions that can best enable corridor efficiency.

### **The Context for Congestion Pricing**

*Ed Regan, Wilbur Smith and Associates*

This session will be on projects that are being implemented across the US. The planning committee for this conference decided it was important to provide a context of how to price facilities, specifically on HOT and managed lanes.

Revenue potential and overall financial success depends on the operational failure of adjacent general purpose lanes. There must be congestion and worsening conditions in order to implement pricing. Pricing is a big policy issue. For example, tensions on the SR 91 project lead to the facility being sold from the private sector to the public sector due to non-compete clauses. Additionally, financing will depend on congestion and worsening conditions on free lanes.

Maximum revenues from express lanes, comes from pricing in the express lane that yields traffic in the lanes well below free flow conditions. More revenue will come when there is less traffic in managed lanes and more traffic in outside lanes. Pricing the lanes is a public policy tradeoff because a facility cannot have maximum revenues and maximum throughput to all drivers in the corridor.

There are three objectives to setting price levels:

1. Ensure congestion free trips in toll lanes, if congestion threatens to cause congestion in the managed lanes, the toll needs to be raised.
2. Optimize distribution of traffic between free and toll lanes to minimize delays in the general purpose lanes. The more vehicles that are in the toll lanes, the less that are in the general purpose lanes which will lead to less congestion.
3. Maximize revenue potential in the express lanes. Why would an agency want to maximize revenues? To fund the building of the project.

Mr. Regan showed charts that showed toll revenue/toll per mile, transactions/toll per mile and travel speeds/toll per mile. These charts were used when determining the toll that would be charged for the expanded express lanes on I-95. It was determined that maximizing the revenue would put about 2,000 more motorists in the general purpose lanes and reduce the general purpose speed by 7-8 mph. If the planners chose to optimize traffic overall, revenue in the peak period is decreased by around 30 percent and traffic in the express lane increases by 3,600 per hour but the general purpose lanes increase in speed around eight miles per hour. The consultants selected the rate in between maximizing revenue and maximizing throughput.

Public policy decisions about pricing goals can definitely affect revenue from projects. Similarly, policy decisions on which vehicles are exempt from tolling (HOV2 versus HOV3) can affect revenue from a project. These policies may also affect whether a project can be funded alone on tolls. The key trade-offs to consider with every project (in terms of pricing): no benefits will come if a project is never built, so you may have to implement a revenue maximization pricing strategy to finance the project. Additionally, financing strategies such as “availability payments” or other subsidy structures may allow public policy goals to be satisfied while tolls still help to get the project built.

## **Bay Area’s Express Lanes Network**

*Lisa Klein, Metropolitan Transportation Commission*

The California highway system has been through three eras: interstate period, self-help movement (local taxation for improvements) and express lane network (regional partnerships). The interstate period was from 1956 to 1980 when the state was in charge of constructing projects on a pay-as-you-go basis with gas tax. The self-help movement from 1984 to present was when county sales taxes financed improvement in local counties, primarily HOV lanes. The express lane network is here now and moving forward which is a regional partnership that is neither state-driven nor county-based, the network is financed with voluntary toll payments. This is more regional because traffic patterns are not necessarily county-based.

The Bay Area is looking to express lanes because the lanes can squeeze more mobility out of scarce road capacity by encouraging transit and HOV. You can “do more with less” with express lanes. Express lanes will allow for closing gaps in the HOV system and managing the carpool and bus lanes more actively which will provide better utilization of the overall freeway.

Financing is important because the gas tax alone does not maintain the facility, let alone pay for the management and operations of facilities; nor can it keep up with the need to complete the region’s carpool lane system.

The approach for the Bay Area is “best fit” by trying to put new HOV lanes in existing right-of-way.

Express lanes in the Bay Area are technically HOT lanes but because HOVs and transit will be free of charge; however, we have adopted the term “express lanes”, which has received better public reception than “HOT lanes”.

The Bay Area Express Lane Network consists of 800 miles of express lanes (HOT lanes), which includes:

- 500 miles of converted HOV lanes.

- 300 miles of new HOV lanes with 60 percent of those “closing gaps” in the network. The new lanes represent a 5 percent increase in freeway mileage.

I do not believe revenue generation and traffic management are in conflict when looking at the bigger picture. The Bay Area is trying to raise revenue from tolls to finance a network completion to help reduce delays and emission. The Bay Area is not levying tolls to get rich; it is to complete the system with the main goal of completing the network faster. Tolls allow the project to be implemented faster and be paid off faster. It is a very aggressive goal. The improved system will help reduce travel times by up to three billion person hours and reduce CO<sub>2</sub> emissions by around ten million tons.

There are big gaps in the network right now. By completing the network and closing the gaps it really helps create an express bus network.

The Bay Area is seeing several areas of tension right now. Currently, there are legislative issues. The idea of system completion is not a compelling enough story to make legislators move on transportation issues. It is very difficult to convey the big picture. Assembly Bill (AB) 744 which has language that states a fee structure must prioritize person throughput and travel time reliability for buses and carpools. The second bill, Senate Bill (SB) 1245, states that no tolls can be collected for vehicles meeting carpool occupancy requirements and occupancy requirements can be increased only if it will maximize person throughput. These bills are not concerned with system completion but throughput. Neither bill has been passed to date.

The best way to get the network in fast is to use a “build-in” design. This is using a painted stripe as opposed to concrete barriers with very few access ramps. There is not a lot of right-of-way to put dual lanes in these footprints. This design is not favored by the financing industry. Financing industry prefers a more robust footprint design.

A network introduces a level of complexity that is not seen in a single corridor. Decisions that are made to have a seamless network will affect both revenue and throughput. In order to get a seamless network, both revenue and throughput are not necessarily the most important things.

In implementing this project, it is important to keep the big picture in mind. Messages to the legislature and financing industry must be tailored to help the region meet its needs.

## **How Revenue and Traffic Management are Combined in the North Tarrant Expressway Managed Lanes Project in Ft. Worth**

*Matt MacGregor, Texas Department of Transportation*

What are the main objectives for the North Tarrant Expressway (NTE)? Is it revenue or mobility? It is both. In Dallas, there is a need for congestion relief. A current look at



congestion in Dallas shows most of the area has severe congestion. When the three current comprehensive development agreement (CDA) managed lane projects, NTE, I-635 Express Lanes, the DFW Connector, come online, there is less congestion in the area and with more managed lane projects congestion will continue to improve. Building the network and filling in holes can reduce bottlenecks and allow a focus on other needs. There are HOV lanes that are not currently HOT but need to go to HOT.

If you want toll rate flexibility, you need to have performance measures and a monitoring and reporting program. The ability to raise toll rates is easier when you have performance measures and reporting to prove it is necessary. Agencies can have higher mobility and higher revenue with performance measures and reporting. People have to move in order to generate revenue. Without predictability and reliability there will be no mobility or revenue. Without revenue you cannot have a project. In order to get all of these, agencies have to have performance goals and measurements. Once these are started they must be maintained.

The CDA projects underway in the DFW area are: DFW Connector, North Tarrant Express (NTE) and I-635 Express Lanes.

North Tarrant Express: \$2.55 billion for construction, right of way, utilities, operations and maintenance. Project required \$573 million in TxDOT funding for 13.3 miles and is expected to open in June of 2015. The CDA for segments 2E-4 are for financial planning, development planning and use little or no public funds. The concession is a 52 year agreement. The managed toll lanes are to provide a reliable average speed of 50 mph or more by adjusting the toll rate. You cannot just take the toll away because the lanes would be full just like the rest of the general purpose lanes. You have to remind people you are providing a service. An additional lane can be added in the future if warranted due to extra right of way. Additionally, general purpose lanes can be added. The facility is self-leveraging itself. It is a big footprint and gets the whole facility rebuilt. Grade separated access locations are throughout the corridor to reduce the weave. Aesthetics are important in the project. The local community came to the table to direct the look, and can additionally determine if they want to add more features to the project at their cost. The local toll authority does all the back-office operations which adds additional complexity to the project.

A key component to the CDA Exhibit 4 - Toll Regulation is the "demand factor" page of the exhibit which tells the developer how much can be charged on the lanes based on speed and number of vehicles in the lane. There is a \$0.75 per mile cap on tolls but it won't get that high unless you get people in the lane. Once operating there are compliance points which must be met or there are penalties to the concessionaire. Any rebate(s) on tolls will go to the local region to do with what they want to do with it. Key components of the Regional Transportation Council (RTC) ML toll policy are:

- \* market based pricing,
- \* 50 mph speeds,
- \* transit friendly,
- \* no green vehicle discounts,
- \* motorcycles are consider HOV, and
- \* tolls remain on the project even after the CDA expires.

We all want to be in the desired range of the speed/traffic flow charts which is just above or at LOS E. Dynamic pricing is not a windfall of money, just a way to manage traffic. Performance goals and measures must be documented annually. This will be achieved by ITS and the tolling infrastructure.

Texas is interoperable and has arrangements to share tollroad transactions with NTTA, HCTRA and TxDOT.

Transparency is key to long term success and that requires good performance measurement.

**The SR 520 Lake Washington/Seattle Urban Partnership Agreement Project**  
*Craig Stone, Washington State Department of Transportation*

Washington State will start tolling on SR 520 in March 2011 through an urban partnership agreement with the USDOT. Is tolling on SR 520 all about the money? Legislators would say “yes”. Is it all about traffic operations? DOT partners would have to say “yes”. It is important to make sure all partners are happy. The state is reintroducing tolling back into the system in Washington. It has been a generation since tolling was last used in the state. Washington has been learning about tolling from around the nation.

Washington State is using a three-part strategy to address congestion, and tolling helps to address each area:

- add capacity strategically – address key chokepoints and bottlenecks,
- operating efficient roadways – get the most from our assets, cannot build way out of congestion,
- managing demand – provide more travel choices and options for people and freight.

In 2007 the Tacoma Narrows Bridge opened with electronic tolling and toll booths. It has been a success. People have seen speeds increase 25-40 mph and 30-40 minute travel savings. This project has been all about the money. The bridge charges a flat rate toll.

The SR 167 HOT lane project opened in 2008 and has been able to move traffic in the HOT lanes as well as the adjacent general purpose lanes. This is a dynamic rate project which has a minimum toll of \$0.50 up to a maximum of \$9.00, which it has hit only four or five times. This project has been all about traffic management.

SR 520 corridor is an existing facility that was paid for by tolls which were removed later. The Toll booths came out in 1979. Now the state needs to replace and widen the bridge. Tolling on SR 520 is both about the money to finance the replacement, and about improving traffic management with variable tolling. In 2008 the legislature set up policies on how tolling would be used in the state. They also implemented a Toll Implementation Committee (TIC) to listen to

the public about how tolling should be set up for SR 520. This allowed the TIC to get the story out and explain why the bridge would have early tolling during construction and instead of waiting until the new bridge is complete. \$250 million of the financing comes from early tolling.

There are two bridges across Lake Washington, SR 520 and I-90. There are big questions about the diversions which will cause traffic management issues on I-90 when SR 520 begins tolling. Financing the project has been the biggest issue. Washington State Department of Transportation (WSDOT) does not believe enough funding is available to reconstruct SR 520 without tolling I-90. This project will have variable time of day tolls. Flat rates will not provide enough revenue. Tolling will be all electronic without toll booths. WSDOT uses the speed-flow 'boomerang' chart to show that 45 mph provides the most throughput and how pricing will be set to allow traffic to operate more efficiently. WSDOT research determined that 76 percent of customers will not change their travel behavior, while the others will switch to transit, use alternate routes, or not make the trip.

How does tolling help with the 2040 regional transportation plan? It is believed that tolling will help the environment by reducing CO<sub>2</sub> gas emissions, funding and congestion/mobility. By 2020, WA is expected to have 300 miles of express lanes in place. Some of the facilities will be dual express lanes on I-405 (similar to I-10). It is expected that new bridges and new capacity would be tolled. By 2030, WA expects to have all limited access facilities tolled in the Central Puget Sound region. Ninety-eight percent of municipalities agreed to this plan when it was adopted in May of this year. Only 2 mayors did not support the plan. One was a mayor of a rural city who said there is no way to toll all facilities and one mayor from a major city that said the plan did not go far enough.

### **Audience Questions**

Have you run through the numbers if the system has to go up to an HOV3+, and are you looking at expanding express bus service?

*Klein: We need to do more research in this area. To expand transit services we will have to be more aggressive with LOS requirements.*

How do you enforce the managed lanes and what are the challenges of this?

*MacGregor: It is up to DART and The T (local transit providers) to provide enforcement. The developer is also supposed to provide assistance with this by providing a light that will turn on when someone is a violator. There is no automated enforcement for managed lanes at this time.*

*Stone: All HOV lanes have lights on the gantries. We do not believe this is a big problem in the WA area. WA has one of the highest compliance rates for seat belt use and other*

*laws. Everyone must pay on these facilities with the exception of transit and agency vanpool exemptions. For the bridges in WA there is no HOV violation, only toll evasion.*

*Klein: On the Express Lanes on I 680 in Alameda County there are indicator lights that alert the California Highway Patrol. Currently CA is testing the feasibility of all vehicles having toll tags. These toll tags will have switches that allow users to “self declare” and only vanpools should be able to flip the switch to not pay a toll. The area is moving towards having toll violations but for now the area uses HOV violations.*

## SESSION 2

### Can Pricing Be a Win-Win Congestion Strategy?

**Moderator:** *Lee Munnich, Humphrey Institute of Public Affairs*

I have been involved in congestion pricing since the early to mid 1990s. In Minnesota (MN) pricing is used as a tool to manage congestion and generate revenue for the transportation system. When I first started working on pricing, I read a study that the FHWA Policy Office conducted on the potential for congestion pricing (CP) in US. The study concluded that the economists were right and that CP would work to manage congestion and that the technology existed to implement CP in a variety of different forms; the only obstacles were political and institutional. My work has been to address these political and institutional issues.

CP can be a win/win strategy. We know there are benefits, but how do you get there? A chart from the FHWA International Scan report displays public support for CP. The chart (found in the PowerPoint slides) shows 40-60 percent support for CP when first introduced to the public. However, when CP is closer to implementation opposition begins to develop; but when the public sees CP working, as in Stockholm and London or HOT lanes in the U.S., public support begins to rise again. In the political view, people hate CP until they see it work. Edinburgh, Scotland, and Manchester, England, tried to implement CP through a referendum process and got blown out of the water with negative opposition. So how do you get support?

Minnesota has been working through a grass-tops method. A grass-tops method is contacting political and transportation leaders to get them to understand the benefits of CP and work with them on defining the proposals.

The Minnesota Department of Transportation (MnDOT) has supported exploration of CP since the mid 1990s; however, Minnesota initially faced political opposition to proposed tolling and pricing projects. HOV lanes had been built on I-394 in the early 1990s, but the public was frustrated because the perception was that the HOV lanes were being underutilized even though there were a lot of people being transported in the lanes on buses and carpools. Some legislators wanted to open up the lanes to all users but MnDOT and FHWA did not want to do this. In 2003 legislators in the corridor agreed it was a good idea to open it as a HOT lane. The bill to implement a HOT lane passed with strong support of legislators and no significant public opposition.

The second Minnesota project was developed through the Urban Partnership Agreement (UPA) process. MnDOT proposed MnPASS Lanes (the brand for electronic toll collection) on I-35W for the second project. The process was discussed with mayors within the corridor who wanted bus rapid transit (BRT) in corridor; however, BRT was at least 12 years out. The federal government offered them \$133 million to improve transit if CP was adopted, allowing BRT

plans to progress much earlier than they would have without the UPA funds. The MnPASS lanes moved forward because the public saw that they were working on I-394.

It is not just the benefits of CP that are important but how CP works with other strategies that affect livability through transit, land use, community and economic development. We still need to understand what sustainability is and how we continue into the future. Another big issue is the equity or fairness of CP. Access must be improved for all who might need it and not just for people who can pay for it.

### **Carpools, Transit and Pricing: A Comprehensive Strategy**

*Samuel Johnson, San Diego Association of Governments*

I am the Chief Technology Officer for the San Diego Association of Governments' (SANDAG) Intelligent Transportation Services Division which focuses on bringing innovation in the way transportation systems are managed and how services are delivered to customers. Current responsibilities include strategic planning, implementation and operation for the systems management, traveler information and electronic payment programs. These programs include multi-modal management systems for highways, arterials and transit. I also work with the region's 511 traveler information system, the region's fast track program, smart parking and the compass card.

San Diego HOT Lanes can and do work. San Diego is lost in congestion. How can San Diego improve mobility without increasing facilities? Everyone wants to get traffic flowing and get home easily. SANDAG must meet challenges, naysayers and others that do not want to move forward because of current and past issues or just because they hate the concept. San Diego needs sustainability, livability, and equity to make this tolling work in the area.

Pricing alone does not bring sustainability, livability and equity but it helps. The San Diego model for pricing has been about mobility management, choice and transit benefits. The San Diego concept includes pricing but always includes choice. It is important to never let the main lanes lapse because this would take away choice from everyone that cannot pay. The HOT lane concept creates competitive service among carpools and transit directly in the corridor. The I-15 Express Lane is similar to the Katy freeway using connections to park and rides but it also provides connections to housing developments. It is a comprehensive solution using transit service, carpool facilities, allows single occupant vehicles (SOVs) and congestion pricing. Leaders made proactive investments and SANDAG has proved pricing can work. The FasTrak program has the following goals:

- Increase use of express lanes from less than 9,000 to 22,000 per day mostly through carpool usage. After implementation of pricing carpool usage grew 110 percent.

- Provide funding for transit services in the corridor. Provide \$1 million per year for two new express lanes in the corridor and cover 85 percent of the operating costs for the Inland Breeze (BRT).
- Improve throughput in the corridor and improve overall congestion in main lanes which allows more traveler choices.

The pricing program began in 1998 and the following benefits have been realized from the program:

- Express lanes carry about 2,800 vehicles per lane per hour on a two lane facility; about 5,600 people per hour which creates 2-3 lanes of congestion relief to main lanes.
- Growth in carpools with implementation of pricing program. Opening of dynamic pricing lanes increased FasTrak usage and increased BRT and HOV usage.

SANDAG has found that the travelers in the region are smart. If time and money are saved when carpooling, travelers will continue using the HOT facility.

SANDAG continued the system's expansion by adding eight miles on the facility. In 2005 SANDAG opened a new east/west corridor, SH 56. The opening of SH 56 led to a change in travel patterns which resulted in 40 percent reduction of travelers on I-15 and the express lanes because the users had an alternative route to use. Yet, when the facility was expanded, it brought new users to the I-15 corridor and the facility is now back to the original numbers due to new growth in HOV use. Due to new users, transit funding has been increased to \$2 million for the corridor.

The San Diego model is about the ability to manage traffic in the corridor. In 2009 San Diego made \$ 2.5 million in revenue on the facility with 79 percent going to cover operations on the facility include tolling itself and contribution to the California Department of Transportation (CALTRANS) to help maintain the facility (signage, sweeping, etc.). Twenty-one percent of the revenue still goes to transit.

The SANDAG program is about mobility and keeping prices low on the facility. SANDAG runs the tolling program as a business but does not want to make too much money because the main focus is on efficient transit operations. Pricing is a minimum of \$0.50 and a maximum of \$8.00 and has historically remained low. In the past the average trip charge was around \$0.75 but now is an average of \$1.30. Ridership has grown (17 percent) most likely due to increases in gas prices but also likely due to the expanded facility and travel time savings.

Public support for "managed lanes" has grown in San Diego because the public sees the system working. In 2002 (last major public outreach) there was high approval by FasTrak customers and other users such as carpools, transit riders, and main lane users. This outreach included:

- 25 stakeholder interviews with staff and community leaders;

- focus groups with I-15 main lane and express lane users, and transit users;
- random dial telephone surveys; and,
- intercept surveys at park and ride lots.

Overall, the surveys suggested broad support for express lanes and pricing lanes. 88 percent of FasTrak users and 66 percent of the general public supported pricing lanes. Stakeholders and legislators want to see this success repeated in other corridors.

When asked the question “is pricing an effective tool to keep lane free flowing”, 71 percent of telephone survey respondents said yes. SANDAG believes that since the majority of the general public sees a benefit to the service that translates into equity for all potential users. When SANDAG compared demographics, it was found that there were similar approval ratings among different age and ethnic groups. In 2004, voters approved expanding the transit sales tax by a 2/3 vote (67 percent approval). The increased sales tax provided \$7 billion dollars to complete the I-15 express lanes and duplicate the model on I-805 and I-5 which are some of the state’s most heavily congested corridors. So all-in-all, SANDAG has seen CP work as a part of a comprehensive approach and it has been a win/win situation.

### **Options for Non-Banked Customers**

*Jim Wilson, TransCore*

I believe most roadway patrons know that there needs to be a reduction in roadway usage to help out with congestion and they know CP is a good strategy. Patrons recognize the need for the cutback and know it is good for livability and stability of the system and are fine with congestion pricing as long as they have a choice.

There are benefits to CP even to those who do not use a facility on a regular basis. There must be a win/win situation that allows congestion pricing to be acceptable to all. First, there must be a benefit for both the agency introducing it and the patron using it. It is important that there is an option for all customers that does not exclude cash customers. In the tolling business it is important to pay attention to cash customers because electronic toll collections (ETCs) only account for 80 percent of customers and 20 percent will not join a toll collection program. Legislators will be concerned with the cash paying patron. Legislators hold an agency accountable for cash paying customers and make it an issue when the agency tries to implement or expand a tolling program. Generally cash paying customers are associated with a lower income population but this is not always true. Politicians may make this correlation and make this an issue for their constituents. Cash customers are good because there are no credit card fees associated with them. Additionally, the toll system may need cash customers to sustain revenues.

There are several reasons customers remain cash only patrons. TransCore’s experience in Puerto Rico was that many people did not have bank accounts or credit cards. Puerto Rico is behind the



times with most people cashing checks and spending out of pocket. Moreover, credit is not cheap anymore due to increasing rates. Fees associated with credit cards (yearly fees and interest rates) are increasingly more expensive. Some customers like to remain anonymous due to a fear of “big brother”. Some cash customers will be from out of state or they do not use the system on a regular basis, so there is no need for these travelers to join an ETC program.

There are plenty of options for cash collections. In Puerto Rico 40 to 50 percent of customers are cash customers and reverse debit gave them access to the system. TransCore offers external options in Puerto Rico through retailers, bank systems, and security firms. TransCore partnered with Texaco using a reverse debit card where an account can be opened by purchasing a “kit” and patrons can replenish tags. The kit contains instructions, windshield sticker tag and a magnetic striped card. When the customer goes to Texaco and purchases the kit, the clerk activates the card and the windshield sticker is available for immediate use. There is no registration or vehicle information required for the purchase of a kit. Now in Puerto Rico there are 140 retailers participating. Before in-lane replenishment (ILR) was available, retailers handled 42 percent of sales and allowed a third of all replenishment to be handled in cash.

Internal options such as walk-in customer service centers, toll plazas and kiosks are available, and the ILR lanes can provide in lane replenishment. Similar to an ETC lane, the driver pulls into the ILR lane and their tag account information is displayed for the booth attendant. Patrons can hand over amount to add to account and it is immediately added to the account. The cash is put into a safe immediately inside the booth. Fifty-one percent of patrons prefer cash as their payment option. These patrons either need or want to pay with cash.

In 2004, 45 percent of Puerto Rican patrons were cash customers. By 2008, the number of cash patrons declined due to inconvenience of going to Texaco and an increase in gas prices. There are currently eight locations with ILR booths that represent 46 percent of sales. Fourteen more ILR booths are planned because patrons prefer this convenience.

The overall message is that CP is only a win/win situation if cash customers are included. By allowing cash paying customers agencies can increase revenue and create equity.

### **Synergy between Managed Lanes and Bus Rapid Transit**

*Marty Stone, Tampa Expressway*

Most people think you cannot build your way out of congestion. I believe you can build your way out of congestion if it is done in a smart way. A bus toll lane is a win/win solution in terms of congestion and revenue. A bus toll lane is a transit project that happens to be a toll highway at the same time.

The three current buzz words in the industry right now are equity, livability and sustainability. I define equity as having transportation choices both public and private (because the private sector has a lot to offer). Equity is about being affordable and accessible and opening up transportation

facilities to everyone. In truth, many HOT and managed lane projects are exclusionary in one form or another. The toll industry must open up to cash users and occasional users. The toll industry needs to look to create affordability which can be achieved when everyone pays because then the price is lower for everyone. Livability is the quality of life both economical and environmental for individuals and the community. Livability comes when the toll industry can provide significant long term congestion relief. Sustainability is being able to provide a way to maintain environmental and financial conditions to fund new capital improvements including public multi-modal transit systems.

The bus toll lane itself can achieve all three of these things (equity, livability and sustainability) by combining the operational and economic strength of transit and tolls. The bus toll lane is a true transit project which employs the best of BRT, electronic toll collection, video toll collection, managed lanes and variable CP. SR 91 (in California) made everyone aware of the benefits of managed lanes and set the tone for projects that are being undertaken now.

The Selmon Expressway in Tampa is 10 miles of elevated express lanes that run from a bedroom community into downtown. Last year FHWA awarded the Selmon Expressway the Best Structures project award which is a big achievement for a project that received no federal funds. The Selmon Expressway helped the Tampa Hillsborough Expressway Authority (THEA) develop the idea for a bus toll way. It is a funding and operation partnership between transit agencies and the local and regional toll authorities. The physical concept is not new, it is a new exclusive lane (new capacity, not conversion of HOT/HOV) dedicated first to public transit through BRT and express bus. This project will be guaranteeing transit capacity and reliability for BRT and is about making transit a competitive choice. If you want to increase the numbers of people on your highway, you need to move a lot of people through public transportation. After guaranteeing the capacity for BRT, the toll authority will sell all the remaining capacity. It is a true managed lane. THEA will not give away capacity because when you give away capacity, you give away the ability to control congestion and in long term maintain sustainability of the project. The key concept to operating a project like this is about making the project sustainable through the long term and then using variable pricing to make sure the lane ensures free flowing traffic.

A bus toll lane is a new partnership between transit and toll agencies to fund construction and operation of the lanes. It is a public partnership that combines all our resources to fund new capacity. The concept differs by suggesting that transit should be an equity owner in the highway system. A bus toll lane takes advantage of what transit and toll agencies both bring to the table. Transit providers know how to buy and operate rolling stock; there is no need to create a new agency to do that. Toll agencies know how to collect tolls and run back offices and maintain highways. Transit providers should have an equity ownership of lanes because it is an equity-based model that provides true public sustainable funds for operations of public transportation. Transit must have equity because the bus toll system is an equity revenue system

that is sustainable. Transit can get great FTA grants to build but have problems generating enough revenue to maintain operations. The bus toll lane will take funds from fare box and net toll revenue off a bus toll lane to provide an inflation sensitive sustainable revenue stream for public transit. There has to be a serious change in policy to do this within the US DOT at all levels.

Concerning equity, livability and sustainability the bus toll lane will first provide attractive, competitive, quality, affordable transportation to the people. Second, it will provide long term reduction of traffic congestion and the benefits associated with that such as air quality improvements. Congestion will always be manageable if the price is managed properly (congestion insurance). This helps the commuter that has to change their trip have congestion insurance by paying a toll. Additionally, there is a positive impact on the community as we are not only moving people, but goods and services which is critical to local economies. Lastly, bus toll lanes would be putting toll revenue back into public transportation. Excess system revenues could provide more services and improvements.

I believe Houston has the most innovative system in the country and would like to see Houston use revenues to build and enhance public transportation system. The whole purpose of this presentation is to push the idea of bus toll lanes to solve problems and to encourage FHWA and FTA to consider more public partnerships to enhance systems.

### **Audience Questions**

The highway trust fund is broke and there are no funds from FTA or FHWA. Where is money going to come from to build these lanes?

*Stone: FTA still has grants available and revenue (tolls) from equity partnership. The transit agency doesn't have to put up all the funds. The transit system can put up 50 percent and then sell revenue bonds, like in Houston and after operation costs are paid split the revenues 50/50. Currently the transit agency puts up the capital investment to buy capacity and toll agency gets all the net revenue. Toll agencies know how to get net revenue because that is what they are good at doing. Our problem is to get money up front. Put a partnership together and this can create a synergy that works.*

Most of you have read the FTA administrator's recent speech in Boston suggesting that transit agencies need to look more carefully at the potential of the bus as a cost effective alternative. I strongly suggest getting Marty Stone's presentation in front of him.

*Munnich: During the UPA solicitation process the USDOT discussed how to combine transit with highway and CP it was a big incentive as to how MN approached its project. I am just wondering if transit people could see the great benefit from this partnership.*

*Stone: Regional FTA administrators think highway folks are trying to steal our money. We want them to understand this is an equity ownership of the lane, no different than them building the lanes and selling capacity and receiving the benefits of the revenue. No different than CSX building rail and selling off excess capacity and let others use it for what they want to use it for to transport what they need. We are saying to FTA, own the guideway, lease the guideway and get the long term economic benefits of the guideway.*

Sam, what do you think of the use of transit as an equity partnership and development of toll facilities? SANDAG has a direct transit benefit from their service. SANDAG is the only agency that operates both the toll and the transit in a region, right?

*Johnson: Great idea – San Diego did win an UPA award to get this type of implementation on the ground, a bus on shoulders project to create a dedicated bus lane on 805 which will be a 20 mile corridor with a dedicated bus lane with ITS components. The second key component of the project is to sell off excess capacity but our project was not highly publicized. FHWA and FTA are very supportive of our project.*

*Stone: This is much easier in agencies that do have both capacities. There are other agencies that do have both capacities such as Metropolitan Transportation Authority (New York) and Jacksonville Transportation Authority (Florida) which are responsible for both tolling and transit, but it is harder to get both the stand alone agencies with traditional funding together.*

*Johnson: It wasn't easy, SANDAG does not operate transit, they have their own funding. We are still trying to get this project off the ground. We are hoping for success.*

*M. Stone: When we present this concept to local transit agencies in FL they love it. All the transit agencies want to know how to make it happen.*

Are there other states thinking about this approach? Anyone else using a BRT/Tolling approach?

*Swank: We have been doing this in Houston for 25 years with METRO giving funding to HOV lanes which were dedicated to transit first. Now the lanes are being converted into HOT lanes. The initial project was only six lanes that were created as bus only lanes but over time they have been converted to include other vehicles.*

It appears that the HOT model is for all transit to go free. It seems that transit agencies putting in an equity investment to build lanes and waiting for tolling revenues to be realized is not as good as getting use of the facility for free. Why would a transit agency want to take this route?

*M. Stone: I suggest looking harder at the tolling business. The Texas toll project is a good example as it has been around for a long time. We can manage price and ensure we can pay our debts and costs of operation and maintenance and use excess revenue to improve transit systems and expand. Florida has not built a new highway in a long time. The tolling agencies have been building them. States are looking at tolls and transit should be a part of it because most transit agencies are fortunate to have 25 percent of operating fees from fare box and they are subsidized. The other 75 percent has to come from some place and it should come from those willing to pay.*

California, Florida and Texas must be exceptions. Most toll agencies I know struggle to meet net service costs. I find it strange for transit to prefer investing instead of free usage of facility.

*M. Stone: It would be their facility. They would invest and sell the excess revenue and using price management to always keep these lanes flowing at speeds of 55mph or higher. No more than 1,800 vehicles per lane and sell to everyone, this way you keep the toll down, much more equitable system because it opens access to everyone, especially if you use technology like video tolling.*

From Jim's example in Puerto Rico, if 20 to 30 percent of customers are unbanked, how can you get these people to pay? Can they use mobile phones to pay? The cell phone industry seems to have almost 100 percent penetration in this unbanked population; are we not looking beyond the box enough to get to this unbanked population and payment systems?

*Wilson: We don't always need to think outside of the box, other people have already done that. I don't think we need to, there are enough alternatives. We have not have a lot of visitors in Puerto Rico to see our program. Customers could potentially stop and pay for five tolls about every fifth time they drive through but they chose not to do that. In the Middle East they are very comfortable with SMS payments. They have established pay accounts via SMS. We also communicate with them via SMS when their accounts get low. Don't necessarily have a credit card but have an established account for SMS. I disagree that we need to think more outside of the box because there are alternatives out there that are being used.*

*Samuel Johnson: It is a great idea to look at making it more accessible to more users. Is there a market for allowing alternative payment technologies on our facility? In San Diego it is a true choice facility. If we have a true cash-based customer base, will we get our investment back by implementing facilities for cash users? We don't have the infrastructure (physical ability) to put in the in-lane replenishment lanes.*

*Marty Stone: In a complete managed lane environment where there are no carpools, you do not have to worry about counting occupants or HOVs or motorcycles or hybrids. Everyone gets tolled, so there is no need to worry about occupancy. It is difficult and expensive to enforce occupancy requirements. Eighty percent of our revenue comes from 20 percent of our customers. That is the bottom line. We have a lot of casual users (once or twice a month) on toll roads. A high percentage of users on HOT lanes do not use the facility every day. Somewhere between 15-30 percent of your customers use the lane everyday; but the majority are occasional users. These occasional users are being excluded if you do include those who do not have a credit card or are unbanked. There are over four thousand sites in Florida where people can pay their utility/phone bills and they will be able to pay their toll bills there too. Want to make open toll lanes usable for everyone. Florida could use the cash approach to having a transponder, working to make cash replenishment sites available for prepaid accounts. We also want to make it available for post accounts (where we read license plates and send bills) to pay cash.*

## **Lunch Presentation: International Pricing Scan Presentation**

***Bob Arnold, Federal Highway Administration***

Mr. Arnold presented findings from an international scan for reducing congestion using public transportation and road pricing. The problems identified globally are: sustainable funding, environmental issues such as greenhouse gases. The scan looked at demand management in Stockholm, England and Singapore and revenue generation in Germany and the Czech Republic. A summary of the scan is on the FHWA website at <http://www.international.fhwa.dot.gov/pubs/roadpricing/>.

The point of the scan was to look at other countries that are doing this (pricing) or have advanced the state of practice.

### Demand Management

In Stockholm there was a huge public outreach campaign which was a big part of getting the public involved. A lot of people got to vote on the project but the people whose vote seemed to count the most were the people that live inside the city because they received the largest benefit from the project.

London has a pricing system that is important for the city center. In London the purpose was to reduce congestion, but the congestion came back. Why did the congestion come back? They took advantage of the reduction in congestion and transferred some of the capacity that they picked up and transferred it to transportation with an example being express bus lanes. Other congestion came from the closing of some major streets around attractions and converting them to pedestrian malls. These roadway closures diverted traffic from some busy streets onto other arterials. Additionally the reduction in congestion allowed the city to do some major renovations on sewer and water construction which closed parts of streets and created additional congestion. The sewer and water construction is due to be completed by the time the Olympics come to London and the city will exchange congestion due to construction with tourists. This is an example of where they had one purpose in mind, set up the program accordingly and took advantage of the reduction in congestion. While the congestion came back, however, London has offset the congestion with other livability or transit benefits. There is a little bit of a pushback going on with the western expansion of the program in London but they are still moving ahead.

Singapore has had congestion pricing programs for quite a while due to a very serious congestion problem. Singapore has an aggressive pricing program and do change prices on a monthly basis. They have been through many different phases. Initially they had someone at the gateway to the city counting and looking for stickers and now they have an electronic system. The cost of a car in Singapore is stunning. The government puts a lot of effort into minimizing the supply of cars to the public which is one of their main strategies. The average cost of a car in the US is \$13,000. A car in Singapore after taxes, permits and fees can cost up to \$50,000, but the public

still has the desire for cars and are willing to spend a lot of their income on a car. In Singapore the government is looking at new value added systems that can be added to cars. An example is a reader device that can read a card that is similar to a debit card that you put into the reader and will allow you to pay for things like tolls and parking fees. Singapore has a massive system that accepts these debit cards.

### Revenue Generation

The Czech Republic has a truck tolling network. The Czech Republic bans trucks on Sunday to allow public use during weekends for enjoyment of life.

Germany has a truck tolling system which is used as a revenue generation program. When Germany was reunified they became a crossroads and one of the issues is trucks cutting through Germany in route to other countries. These trucks that were cutting through were not stopping and added no economic value to the country. The trucking industry in Germany was on board with the tolling system from the beginning because they wanted a fair playing field. The trucking industry wanted a system that would do everything. The problem with a system that “does everything” (all of the objectives that the government set up) is that the toll road is very expensive at about 5 to 6 cents a mile for administrative costs alone. It is important for projects to have a clear focus of what the system must do from the beginning.

The Netherlands have a system we might want to look at as a national model system. The system that the Netherlands wants to implement will capture tolls system-wide. Currently there is a problem on the political side which has stalled out the program. Mr. Arnold believes the toll authority is just waiting until the current government moves out in order to put the system in place. The benefit of system is moving from ownership fee taxes (as in car registration fees) to user/mileage based fees. It was very expensive to own a car but to provide more equity the Netherlands is moving to the mileage based fees. The good news for the Netherlands is that the country has a lot of technology to implement the program but the bad news is it will be expensive. Right now the best guess estimate of how much it will cost the user is  $\frac{3}{4}$  cent per mile. On a slide presented earlier Mr. Arnold calculated the current cost of ownership in the US as 1.5 cents per mile. So, if the US changed from a fuel base fee to vehicle miles traveled (VMT) based fee the government would be increasing tax revenues by 50 percent just by changing the way money is collected. The problem here is that in the US we are probably not any smarter than the Netherlands and so we would assume our tax would be increased by 50 percent just by changing the way we collect it but it does not provide additional revenues to the government and would not do anything for the public. So at this time, Mr. Arnold does not believe the American people are ready for the conversion to mileage based fees. A big challenge in the US to implementing this is technology and the interoperability between systems. The US would have to decide how to collect a non-fuel based fee. An additional challenge is to bring the administrative cost down to where it is acceptable to American public. Once the US can bring down the administrative costs, then we can address additional items such as mobility



and congestion pricing through that technology. The Netherlands does not have their system in place but they still have political problems to get through and the high administrative costs.

Major findings of the report are that most countries with clearly defined policies and goals achieved their target outcome effectively. The scan looked at congestion management in Stockholm, London, and Singapore and revenue generation from in Germany and the Czech Republic. The Netherlands is moving from an owner-based fee to a user-based fee. To be clear, the Netherlands is not expecting to make additional revenue but just changing the way fees are collected.

A large scale test in Stockholm was a great way to garner acceptance for the project. The government set up all the equipment and assured the city that the fee collection method was just a test. After the test, the government turned the system off and held a vote but it seems (in Mr. Arnold's opinion) that the vote only counted people getting the biggest benefit from the change in pricing. Additionally, Stockholm did a lot of outreach before the implementation of the program. Performance measures and overall goals were important in order to manage and operate the system. Additionally the performance measures allow the public to see the benefits and understand what the government is doing with the money. The public outreach focuses on showing the users that the additional fees are a good thing to help manage congestion. When implementing a project it is important to link the pricing structure with the benefits to the user. Show users how money from a project is being spent and how the pricing structure reduces congestion and travel times.

The Germans wanted to ensure they did not divert trucks to non mobile alternatives. Although they did not put up permanent enforcement stations on off routes they monitor them and if they see diversions on the secondary or local routes they go in and get trucks back on the major truck routes. Public outreach and communication is a key component at every stage from the decision making phase to the operational phase.

When implementing a system, make it an open source system (not proprietary system) because it makes a big difference. The Germans were able to quickly implement their system and did a good job of getting online as fast as possible but the problem was the system they adopted was a relatively closed system. The proprietary systems can be implemented fast but drive up operating costs because the government is basically boxed into using one system. The Czechs have the same problem. The toll collection units in the trucks are very expensive. Since the Czechs went to a proprietary system the cost is still fairly high. When implementing a system it is important to balance performance and expectations with the cost of the system.

Interoperability has been a problem as systems expand. In the US we will be able to save on administrative costs as more systems become interoperable and more back offices are linked due to costs going down and less overhead.

Equity and privacy are issues for most of the international systems. Privacy problems seem to be the main reason the Netherlands system has stalled out.

The most important lesson learned in the scan is that as countries collected revenue they use the money as an investment in the public transit system. For example, London has parlayed their reduction in congestion with the express bus lane. Providing transit with tolls goes over well with the public because it shows the revenue goes to a higher purpose. Diversely you can have all the public transit you want but it is the price (of driving) that drives people to it. It is important to have a good transit system because people will move from their car to transit once a pricing system is established.

The scan showed that road pricing works and can work for different objectives (revenue generation versus demand management). The success in the US will be dependent on driving down overhead costs, so we will not just be collecting revenues for revenues sake. People will need to see improved services with pricing plans and something worth-while being done with their money.

### **Audience Questions**

It is politically incorrect to say that primary goal of congestion pricing is to generate revenue. What can different regions do to get things going?

*Revenue generation for a specific project(s) is politically acceptable. The public needs to get a sense that the revenue that it generated will be used for a project in the future. The two examples that listed revenue generation as primary goal were Germany and a former communist block country where taking the word of the government is fairly common. The public outcry was not there when these programs started. The people in Germany and Czech Republic saw the need and accepted the programs. When implementing a program the agency must have a clear objective that the public understands and the agency must be able to relate the toll/fee to that objective and report back to the public on progress with the project.*

What about building a bus transit lane and selling as capacity lessens?

*We are sort of doing with some of our UPAs, working with FTA using FTA money to do that. When I talk to them they seem to be onboard with it but I do not disagree that there is a lot of push back from FTA rank and file saying we are just using transit money for growth, but their leadership seems to be okay with the concept.*

## SESSION 3

### How to Implement Your Pricing Project

Moderator: *Matt MacGregor*, Texas Department of Transportation

#### **Public-Public Partnership for Houston's New Katy Managed Lanes Project**

*Lisa Castaneda, Harris County Toll Road Authority*

Here is some background on the Katy managed lanes. In 1984 the I-10 Katy HOV opened to vans and buses only. In 1986, Harris County Metropolitan Transit Authority (METRO) opened the lane to HOV 2+ carpools. Due to congestion in the HOV lane, in 1998 METRO raised the HOV occupancy to 3+ during peak periods and began a program called Quick Ride (HOT lane implementation) which allowed a 2 person carpool on the lane for a \$2.00 charge during the 3+ peak periods.

In the late 1990s the corridor was moving 212,000 vehicles per day, with 6-10 main lanes, 4-6 frontage lanes, and one reversible barrier separated HOT lane. In 1998 when occupancy requirements during peak periods were raised to 3+, the HOV lanes started running at a free flow rate while the general purpose lanes continued to see increased traffic. At this point the corridor was capacity constrained and the agencies in Harris County knew something needed to change.

The I-10 Katy Freeway managed lanes are the first in Texas, not by choice but because of necessity; the timing for this project was right. Three partner agencies emerged from this project: Harris County Toll Road Authority (HCTRA), TxDOT, METRO. HCTRA was able to come into the project with back office support and contribute \$250 million. TxDOT was able to use the HCTRA funding to build the new facility. METRO got a four lane facility (two lanes in each direction) that had expanded hours, instead of a one-lane reversible HOV lane. Harris County would take over maintenance and enforcement.

The overall plan was to offer more reliable travel times for buses and HOV riders while selling the unused capacity. The project is 12 miles long, has 2 lanes in each direction, serves mass transit and HOV needs during HOV hours. The unused capacity is made available to single occupancy drivers for a toll. The lanes are separated from the general purpose lanes by pylons/candle sticks and operate 24/7. The HOV aspect operates from 5-11am and 2-8pm, Monday-Friday and as a toll way at all other times. The goal of the managed lanes project is to keep at level of service C or 45MPH in the lanes.

HCTRA uses electronic toll collection on this facility. There are three locations for payment on the facility and three or four access/egress points in each direction which is much different from the earlier barrier separated lanes.

The project benefits all agencies involved with the implementation. METRO continues bus and HOV operations and has four times the capacity with expanded hours. HCTRA receives the tolls from SOVs and since these SOVs are no longer on TXDOT's general purpose lanes the congestion is improving in the general lanes also.

HCTRA (Harris County) has its own officers for enforcement. The compliance rate is good as HCTRA places officers on the lanes during the HOV operations Monday-Friday. User complaints are mostly regarding the transition area on the I-10 diamond lanes before and after the lanes turn into the managed lanes. Most people do not realize that the diamond lane is not a toll lane and HCTRA has found it difficult to sign this transition area.

The managed lanes are variably priced with prices changing four times a day. Originally HCTRA put out speed sensors and had software for complete dynamic pricing with changes every five minutes but decided against using the true dynamic pricing but since the hardware and software are installed, HCTRA has the potential to implement dynamic pricing in the future. The managed lanes are all electronic and toll users must have a transponder that is interoperable with our agency to use the facility. Exempt vehicles include emergency vehicles and buses. Two plus HOV users and motorcycles are exempt from toll during designated HOV operations. SOV drivers and trucks pay tolls at all times on the facility. Trucks pay \$7 at each tolling point, up to \$21.00 for the 12 mile facility, which kind of discourages trucks from using the facility.

The rates vary throughout the day. During off peak hours the toll is \$1 for all 12 miles split among the three tolling points (\$0.40 at the toll plaza furthest west and \$0.30 at the other two plazas). During the peak hours (and peak direction, east in the AM and west in the PM) the toll is \$4.00 for the whole trip. To prevent the price from jumping from \$1 to \$4, HCTRA has \$2.00 "shoulder" hours on either side of the peak hours.

The toll lane is a self-declaration lane. The tolling system was originally modeled after one in California with two lanes that continue through the plaza. One lane would pull out to declare a toll next to the booth and a third lane was available for HOV users to pull out into (to avoid tolling). Unfortunately, as the project was developing, gas prices went through the roof and we did not know if we could withstand the criticism from making the entire system HOV 3+, so we thought since we had the capacity we would try to accommodate HOV 2+ riders. Allowing HOV 2+ users changed the design because the amount of HOV 2 riders we expected could not weave in and out safely. So the design now is simply two lanes and as you are at the toll point the left lane is the HOV lane (closest to the observation booth) and the right lane is the tolled lane. During non-HOV hours, both lanes are tolled.

There are three points for declaring at the three observation booths. The signs at each toll both designate the lane a driver should be in. SOVs should be in the right lane during HOV hours to

be tolled. Constables are only providing enforcement during the HOV hours but HCTRA does have staff in the three booths that try to validate occupancy (which is difficult). The constables know how the lanes work and are often able to identify patterns with violators. It is not unusual to drive past a plaza and see a constable there. The violation enforcement system is the same one HCTRA uses on the rest of the toll roads except violations only happen in the EZtag lanes. An SOV driver that passes through the EZtag lane without a transponder tag will be considered a violator and sent a notice.

Users of the managed lanes see an average time savings of eight minutes during peak travel times (not including incidents). The average speed on the managed lane is 58 mph whereas on our general purpose lanes it is 36 mph. The managed lanes have been open for one year; we opened in April 2009. The lanes currently carry approximately 1,720 HOV vehicles during the peak hour and 2,100 SOVs per hour. The mix of vehicles it is split with about half HOV users and half SOV users.

The monthly transactions on the managed lanes have increased from approximately 350,000 to over 1.2 million. Over the last 12 months the lanes have had 5.51 million EZtag transactions and 5.42 million HOV transactions with a total of a little over 10 million transactions on the lanes. When comparing the number of transactions of our system to other existing managed lane facilities we are in the middle. Managed lanes in both Florida and California are HOV 3+ and we are still at HOV 2+.

So far the system has been well accepted by the public because the system did not take anything away from the public. I-10 went from being three lanes in each direction with one reversible HOV lane to 4 or 5 lanes in each direction with two HOV lanes in each direction. The entire facility has expanded, so the managed lanes project added value for everyone, not just HOV or transit users.

### **Audience Questions**

Since you were expanding the general purpose lanes from three to 4-5 lanes was there any consideration to pricing a few more lanes and leave the three lanes that were there before. Why did you choose to go to more free lanes?

*Stuart Corder: Simple. We are in Texas. The public would not have accepted it all if we added more managed lanes.*

*Matt MacGregor: This is a good example of a partnership that is working. It is a good sign that the project is operating quietly since its opening. The project shows that Houston has a good partnership going forward.*

## **Toll Concession Model for the I-495 Beltway HOT Lanes**

*Tony Adams, Transurban*

I would like to give the private sector's view of toll concessions; the pros and cons of these projects. The Capital Beltway HOT lanes project is now under construction in Washington DC. I would like to discuss how private sector together with Virginia DOT (VDOT) put together this concession tolling project.

Transurban is an Australian-based company. We are a toll road manager, investor and operator. Our company has a \$ 7 billion market capitalization (as of two weeks before the presentation) with over 5 million customers worldwide. We are pioneers for all-electronic tolling in Australia.

In Australia we have six assets, primarily in the south along the east coast and in Sydney. In the US we have a road in Richmond, VA (Pocahontas Parkway) and in the DC region we are currently developing the Capital Beltway HOT lanes and looking at developing the I-95/I-395 HOT lanes.

Why do we get involved as an operator and an owner? As mentioned earlier, livability, sustainability, and equality are the three major issues; we work as partners with government agencies to bring about all of those ideas. We bring long term focus. We do not just design it, build it and get out letting someone else operate it. We build valued partnerships with the government and the community. We do not treat the assets as single assets, we treat them as systems assets that will provide benefit. From a long term perspective, innovation is important, and we provide continuous improvements in our systems to provide more value.

From the federal government perspective, traffic is one of the top major concerns. In northern Virginia people still see traffic as the biggest issue. A study was done in April 2009 where 50 percent of those using the Beltway proposed traffic was their major issue because they were experiencing six to eight hours of congestion a day. This congestion costs the local economy approximately \$5.5 billion a year. That \$5.5 billion could improve a lot of projects. We are working to improve these corridors so this money can be used in the community.

HOT lanes are one solution. They have been proposed and accepted by the community and the community understands that HOT lanes are not the only solution. The Capital Beltway project began in early 1990s and continued through December 2007. It involved a huge land take and environmental impact. The project took over 350 homes. VDOT took the concept of HOT lanes which was very innovative at the time and is still innovative. The project was developed as a private/public partnership through Virginia law. The project involved 40 miles of lanes widened by two lanes in each direction with two middle lanes used as HOT lanes which will be tolled. Tyson's Corner is the second largest employment zone in the area of the Capital Beltway project. The most important thing about the project is that it provides a choice for general purpose lanes, transit, HOV, or concession lanes. It has several entry and exit points for HOT lanes which allows greater choice for users.

We have an 80 year agreement with five years to design and build and 75 years to operate and maintain. It is quite an investment and risk because all the risk has been shifted to the concessionaire. The state does not hold any risk for the next 75 years. The Commonwealth is not restricted from making any transportation improvements in the area. The concessionaire has to meet significant performance goals. There are penalties if goals are not met.

In December 2007, the financing was very innovative but it would be more difficult in the current financial environment. The Beltway project involved money from the Commonwealth, Transurban and private activity bonds. The private/public partnership worked for the Beltway project but it is not a solution for all types of projects; particularly, it is not a solution for projects which are not feasible. Concessionaires will not be looking at those projects where there is not a return involved. Another key issue with these partnerships is that private firms do deliver projects more quickly.

The Beltway will use dynamic pricing to manage the demand on the road. Transurban will be looking at using switchable transponders. The average toll for five or six miles will be \$5-6 dollars. There is no toll cap for pricing. We can increase the toll to move people out as needed. We have to maintain safety and performance with a minimum speed of 45 mph. We try not to go below the 45 mph performance measure and try to maintain free flow as much as possible.

There are a lot of new technologies put out on these roads. The electronic system will have a fully-automated traffic management system with 62 cameras with incident detection panels so we can respond quickly and clear incidents. Enforcement from the HOV will be done by state troopers with a technology pioneered in Minnesota with mobile enforcement readers. We have looked at occupancy detection cameras, but our research shows that they not viable at the moment.

The trip time reliability and travel time savings are incentives for carpooling on the transit side of things. Carpools, HOV 3, and transit have the opportunity to use the HOT lanes for free. We provide customer choice, technology, safe roads with important information passed to users. The key to take away is that the project stimulates the community. Stimulus can be used as a catalyst to take on to the next project. Economists have determined that construction of the Capital Beltway supports the community by creating 30,000 jobs in Virginia and putting \$3 billion into the economy during the construction period. Fairfax County where the road travels through had 10 percent job growth and 20 percent growth of the total economy. These are significant numbers when you look at the entire project. To wrap up, concessions work but private partnerships are not the end solution for non-feasible projects but one way to achieve an outcome.

**Toll/Availability Payment Model for I-595 Express Toll Lanes Project**  
*Ed Regan, Wilbur Smith and Associates*

Building managed lanes sometimes requires rebuilding the whole freeway. State Route (SR) 91 was a notable exception where the lanes could be squeezed in the existing median and it was relatively low cost. The I-595 express toll lanes in Broward County Florida combine the innovative use of availability payments together with pricing. Wilbur Smith and Associates did the traffic and revenue studies for the project. The project is the addition of reversible priced express lanes being added as part of the reconstruction. The project is very comparable to the I-10 project, not as much new construction but similar in length and it being a multi-billion dollar project. The project includes major access improvements, interchanges being rebuilt (braided configurations due to lots of bottlenecks at access points) and auxiliary lanes are being added. The total project costs were around \$1.7 billion. The project has three reversible express lanes down the middle of the road. The express lane portion probably cost around \$300 million but the reconstruction of the entire facility is the majority of the cost.

The express lanes will be a chute-based lane project with very limited access points from Fort Lauderdale to I-95 and I-75 in the west. The project is part of a long term plan for fixed guideway transit which will either be express bus service or light rail which was another factor when determining how to finance the road. The I-595 project is 11 miles that runs from around I-75 (in Miami-Dade County) where I-595 turns southeasterly toward I-95 and the Florida turnpike near downtown Fort Lauderdale. In a regional context, this project fits in with other managed lane projects, specifically the very successful I-95 expressway project. Phase 2 of the I-95 expressway project will extend north of I-595 with a multi-managed express lane network from I-95 north of Fort Lauderdale south to Miami for about 22 miles. The I-595 will not quite connect with it but will fit in with it sometime later.

The corridor is heavily congested with 175,000 to 225,000 vehicles per day. It has limited points of access to and from the west and east and none in middle. It has three reversible express lanes and is being financed with a Public-Private Partnership (P3) concession arrangement with a twist. The total I-595 project including the express lanes and entire corridor are being delivered through a P3 concession but tolling will only be used on the express lane and will be controlled by FDOT. Repayment to concessionaire is based on availability payments not directly on toll revenue.

The rest of the presentation will focus on why this approach is being used and why it may be more common in future. Availability payment is a competitive procurement process (this one has a 35 year contract term) where the concessionaire brings the financing to the project to design, build, operate and maintain the full corridor. The concessionaire will get an annual availability payment that is a competitive bid number but not dependent on revenue from tolls but is based on annual appropriation by the Florida Department of Transportation (FDOT). FDOT recognized that tolls alone could not pay for the entire project (probably only the cost of the express lanes but not the overall project) and this is why FDOT chose to use a concessionaire. FDOT's goals in choosing this financing were to:



- provide capacity improvements sooner,
- maximize corridor throughput rather than toll revenue from express lanes,
- minimize the required FDOT corridor outlays while transferring the cost performance and delay risks to the private concessionaire; and,
- enhance the long term life cycle cost efficiency and service quality of the overall facility.

On the issue of revenue maximization versus traffic optimization, FDOT recognized that the revenue would pay for less than half of the project cost. However FDOT decided to maintain control so it could make policy decisions to optimize the distribution of traffic and focus on maximizing the throughput of the total corridor and not on generating maximum money to pay for the project.

It is common to think of roads as toll roads or free roads. If the project is going to be a free road it uses public funds but it cannot be a tollway. This project broke the rules because it used public financing but preserved a portion of the capacity for tolling so the road will be free flowing and the state retained the right to use tolls. Using a higher toll rate of \$3 per trip will increase the revenue by 25 percent but traffic in the express lanes would decrease by 50 percent. The added traffic into general purpose lanes would drop speeds by 6 mph. So by retaining control of the toll rates and revenue risks of the project, FDOT can optimize the throughput on the project and minimize the pain (congestion experienced) of the people who do not choose to use the managed lanes.

The concept of the priced express lane is still a critical part of project. Revenue generated from the express lanes will not pay for the entire project but it is still enough to offset part of annual availability payment costs. FDOT did two availability concession deals in the county's history: the Miami port tunnel in which no tolls were charged and payments were paid 100 percent with availability funds; and the other being the I-595 project where core availability payments come directly from FDOT but FDOT will get some of the money back by collecting tolls. First, you have to break the idea that it is either a toll or free road; that you can combine the two. FDOT can set prices to optimize traffic and FDOT can maintain control of pricing which helps to reduce the public fear of privatization and the raising of toll rates.

The concessionaire did arrange for the financing of the project. The funds that were used are all secured against the availability payments, not against toll revenues. The availability payments do not begin until the project is complete. The capitalization cost is born by concessionaire. The availability payments are also dependent on conformance with operation and maintenance criteria.

So why did FDOT want to maintain control over pricing? FDOT's goals were to:

- increase throughput in the corridor and not maximization of toll revenues;

- remove public opposition against congestion pricing and the relatively high toll rates that may be required in the future to manage demand;
- retain control of pricing in the region. There is a plan for broader network of congestion-priced lanes throughout Florida and private control of I-595 may have impaired FDOT's ability to manage toll rates effectively throughout the region;
- let the concessionaires provide the financing and removing the revenue risk; and,
- allow for implementation of long range plans and ability to make future decisions such as putting rail in the corridor.

Using a concessionaire was a good decision in this case. The Value for Money Analysis showed the availability payment delivery approach saved \$78 million in financing over traditional methods. A portion of the capacity will still be priced to manage demand and help pay for the availability payments. Pricing decisions still remain with public sector to ensure its public priorities are achieved in terms of revenues versus management.

Can it work in the future? This project breaks the historical model of free roads versus toll roads in respect that it is both a toll road and a free road. The concept may expand the range of potentially viable projects nationwide. Construction just started a couple of months ago and is supposed to open in 2014.

### **Audience Questions**

Lisa, the Katy project shows 4,000 vehicle throughput during peak hours on Katy. Is that approaching your design benchmark for free flow traffic?

*Lisa Castaneda: Yes, we were looking at 1,800 cars per lane per hour being the benchmark but Houston drivers drive fast and close together. In some cases we have in excess of 2,700 cars per lane per hour so we are looking at a tolling structure that will control the capacity in the lane. A change in the tolling structure will affect the toll paying customers which are around 2,200 per hour. We are looking at time of day pricing but with a table with the help of Wilber Smith and Associates to spread the peak hour a little bit.*

*Ed Regan: The challenge is the part they cannot control which is the free HOV 2+ users. It is nice to have them, but you don't have the ability to manage. The HOV 2+ go through different lanes, right?*

*Lisa Castaneda: Yes, we have one toll lane and one non-toll lane, but if people start complaining of congestion we could perhaps raise occupancy to HOV 3+ during the peak hours or look at a registration process.*

*Ed Regan: The significance of the question was to show that the traffic is in different lanes and one lane you cannot manage. You have to manage both of those different types of users independently because it is not just the sum of the traffic, it is the traffic in each lane. Being only able to manage one aspect of the traffic can be problematic. It is an amazing success story so far.*

*Lisa Castaneda: We do not expect HOV 2+ will last forever. Eventually we may have to change the process due to increased volume. At the time we looked at different tag vendors and tags; but we have an established tag base here and we did not want them to have to take out their tags and start with another, we wanted to be able to introduce a second tag and have the reader read both tags. We were thinking that if the users had both tags they could zero out the tolls and then we could use both lanes but we decided to start simple with just the declaration lane.*

At the west end of the Katy project, in the afternoon, in the transition from the managed lane to the HOV lane, has this caused issues with merging? Are you using additional signing to tell the users that paid the toll (SOVs) that they need to exit the lane?

*Lisa Castaneda: Yes, the toll road operates to SH 6, which is the end of the managed lanes and the TxDOT diamond lanes there continue to operate but are enforced by the toll road authority, so our officers have jurisdiction. There is no good signage available to say the toll road stops here. The officers have come up with DMS signs and are pulling SOVs over.*

Does the I-595 project have a 35 year contract for operation and control on the facility?

*On the I-595 project the Florida Turnpike will collect the tolls and the concessionaire will maintain and operate in terms of traffic operations on the toll lanes and on the general purpose lanes.*

The operations of the facility are going to be influenced by the toll rates that are set by FDOT who is retaining price control. Does the concessionaire help to control the benchmark criteria to set these operations?

*No, I don't see how they could for either the general purpose or managed lanes because the state is retaining control of them. The state is trying to maintain rates as low as possible that will keep the lanes free flow.*

All projects in various states run into political problems either at the state level or local level. The recent projects in Florida have seemed to move well. Can you tell us what the political back story is that has expedited these projects?

*Ed Regan: The UPA project was obviously a big priority of FDOT in Tallahassee in terms of availability of program. The UPA program offered an opportunity to do the*

*project a lot sooner. In my opinion, the I-95 project in Miami worked exactly in accordance with what the US DOT wanted with the UPA initiative. The I-95 project provided innovative thinking and smart ways to do things such as narrowing lane widths, maximizing efficiency and reducing delays. Its success contributed to the support of the Tallahassee project.*

*Jennifer Tsien: There is less and less money to do things and the congestion was getting worse in the Miami area. Miami was repeatedly in the top most congested cities in studies. Florida has a high appetite for tolling and public support was high with the possibility of UPA money. We needed a partnership and had to go the concessionaire route because we didn't have the money and wouldn't for many years. In our long range plan there was other money but we couldn't wait that long because ten years after the I-595 corridor opened it was already congested. The timing was just good on these projects. Three years before the UPA money we were asked to do lots of studies such as "how can my constituents pay more tolls?" Timing was great due to the introduction of the sticker tags and \$5 transponders in combination with the success of I-95 project has let to public support for the extension of those lanes and other facilities.*

*Ed Regan: It is noted that the public opinion changes once you start the project and they see it works, they get behind it. In Miami, 2-3 years before the UPA project we had to make on-demand presentations to the Miami Metropolitan Planning Organization (MPO) board about managed lanes because there was a predominant opposition there because it is a very economically diverse county and it was a challenge because there was a sense of inequity. It was seen as unfair before these presentations because the rich could buy their way out of congestion, but eventually the public supported it because the UPA program made the people think they should try it.*

*Angela Jacobs (US DOT): The value pricing program funded some marketing and outreach when they were looking at the I-95 study. Also, in Florida there are currently three MPOs that have adopted plans which are considering pricing to help address transportation problems and this has gone a long way for outreach. We do have a fact sheet about the I-95 UPA project and hopefully we will have some information about the operations of phase 1B as well.*

On the Beltway project are you going to require registration for the project or just as long as you are an HOV user it is ok to use?

*Adams: Yes we are going to use a mandatory switchable transponder which can go from HOV to toll lane, but for people who cannot have a transponder we will have a nomination process. The nomination process is where the user can contact the customer service center to give their license plate to set up and pay a nominal fee. Enforcement will be required to ensure they are not taking advantage of the nomination process.*

Do you think that over time you might go to a cashless system?

*Adams: Those systems have merits but we are not looking at it on the Beltway HOT lanes nor the I-95 project we are developing at the moment. The main reason for us not looking at these systems is because the concession says that we will have in place all electronic tolling, no cash booths, essentially a no cash system. What you are suggesting is a version of smart card almost which have kiosks and booths off the road and we are not considering at this time.*

In regards to the availability payment models, is there any reason that the value of depreciation to the private sector couldn't be brought into that so that the private sector might reduce the payment we could get from the government by recognizing depreciation value also?

*Ed Regan: I'm not sure. Bob can you address? I don't know if this is an ownership question.*

*Bob Poole: I'm not tax expert, but with the Indiana highway lease one reason we went to a 75 year lease instead of 50 year was that the tax people told us that in order for a concession company to take depreciation the lease period had to be at least as long as the conceivable useful life which with highways is around 50 years. They wanted to ensure there were no legal issues so they went with 75 years.*

*Ed Regan: Most important is that the public entity made the decision to do pricing in order to preserve capacity but recognizing that pricing was not sufficient to pay for the entire project but the state used it anyway to take what they can get and help pay for the facility.*

I like the concept of availability payments but in Texas you get pushed back because it obligates future legislatures. Have any of you had to deal with this before? And, how did you deal with it?

*Ed Regan: I think that is an issue anywhere because no one does appropriations for 50 years in advance. Within the financial community I'm finding they would consider appropriation risk because we cannot obligate some future legislature to appropriate money but it is considered a much lower risk than a revenue risk. So we have found the ability to finance with availability payments is much easier than using toll revenues to support it. Maybe there is a constitutional reason it cannot be pursued in a specific state.*

I was really referring to the legislators willing to obligate future colleagues and communicate to legislators that it is okay to do this.

*Adams: From a concessionaire's point of view we would be more likely to fund based on revenues than money that is perhaps delegated by the government in 20 years. There is enough science in the forecasts that we can look at the risks and then join with an agency*

*to share them. We are backing our ability to look at the long term risk and appropriate it with the agency we are working with for the project.*

What I was thinking is you can convince the legislators on the point that the agency controls the revenue rates and maybe from a public perspective that control is a positive thing.

*Ed Regan: Yes, it is a very positive thing. Appropriations funding opens up a whole new world. When you start to break down the barrier between public (free roads) and private (toll roads). Many more projects will become feasible if we stop thinking that public roads cannot have toll roads but I don't know when we will get there.*

*Matt MacGregor: We have a pass through toll and pass through finance program which has 15-18 projects that were previously established that we (TxDOT) have a budget and we are spending that program out. These programs were an obligation made for the future. We had some rules out there and we got some kickback/feedback on it and we are now looking at changing it again. We are looking closely at what is going on with these programs in order to improve the programs and increase size. The challenge in Florida is to be nimble enough with those that control the toll rate in order to control the operations of the facility. Transurban can be as nimble as they want to keep it working. Houston is just on the front side of needing to be nimble, so that is your job.*

*Ed Regan: That is an interesting task but we have seen the public sector raise tolls much higher and faster than when the private sector had control of the roadways in Florida. For example the SR 91 project where a private entity built and sold concession to the public sector, the public sector has embraced raising tolls to manage demand without considering political considerations. "Shadow tolls" is the other term for pass through tolls programs and is used a lot internationally. You get reimbursed for each vehicle that uses your facility even if the vehicle does not pay a toll.*

How broad can the scope of projects be with the expansion of states embracing availability payments? In Virginia the attorney general stated that availability payments would be considered a state debt and would come under state debt limits. It is thought that this is the case in most states. Has there been any discussion? Florida has a \$2 billion dollar scale of availability projects. How much can they afford?

*Ed Regan: I understood that availability funding is a different funding mechanism and doesn't necessarily impact the state debt.*

We really need to get answers to this before we present it to other states and try to implement it on a large scale (referring to availability payments).

Follow up comment: Florida passed legislation statutes where availability and design finance is the first draw against future allocations before new projects. So this legislation has reduced the appropriations risk in the future.

On the I-495 project, you spoke of traveler information and integrating it into the system. I am interested in what type of information and what is the integration? What is the emerging state of the art?

*Adams: We currently have two gantries at the entry that can be used for traffic information. We are looking to integrate with other agency's information such as traffic management, 511 and smart phone technology to make all information available on our roads and as users enter HOT lanes to make everyone aware of incidents. SMS texts can be sent out to people but this has to be in the context of safe driving because we have to be aware these people are driving and we cannot just send messages out to their phone. It is about the right way to get messages out to people. These projects are crucial in terms of outreach, education, and marketing. We want to tell people about the HOT lanes project, how to get a transponder and how to use the roads. We will be starting again in terms of construction to let users know about the opening of the project, how to use the road and what information you can expect to see on the road.*

## SESSION 4

### **The Critical Role of Technology in Pricing**

Moderator: *Jack Opiola*, D'Artagnan Consulting

I have to look at and consider the funding crisis Delvin Dennis spoke about early. He calculated the average fuel tax that an American is paying. He showed the average vehicle getting 20 mpg and estimating the average vehicle fuel tax at \$384 per year. But now if you look at the new federal guidelines with a fleet average of 35.4 mph averaged into the mix we only get about \$216 in fuel tax and with inflation by 2015 the actual real value is only \$181. The future in the automotive industry means trying to do more with less.

We are seeing a number of mitigation measures out there that will involve how technology can help. That is what this session will discuss. We will look at the different elements technology of road pricing today. The first element of road pricing we have to look at is that ubiquitous universal form of cash collection. We know we cannot have a toll booth on the HOT lanes or toll lanes where we want them to be multi-lane and free flow configurations. Since we cannot use toll booths, we can look at different technologies out there like video, auto license plate reading, RFID (radio frequency ID) tags that are coming down in price. Tags used to be in the \$9-10 range are now \$2-3 and doing the same job. We are looking at DSRC (dedicated short range communications) tags which are more full-functioning with processors and memory that can handle interfaces. Finally, we are looking at the future being in global positioning systems (GPS) or what we do with our mobile phones. All these technologies are elements to help us move our congested freeways. People do not pay for our freeways now but people will pay for improved service. Most important in our search for technology is finding common standards because there are three major elements constantly in balance:

- 1) technical considerations, how does it work and what do we want from it;
- 2) financial considerations, what is the payment mechanism; and,
- 3) my business rules.

At any time we have to keep two of these in line in order to define the third one. That is where common standards between all of them need to take place. Common standards are required to get to interoperability between systems. Common standards do not necessarily rule out proprietary standards. Common standards need to be a mix of open standards on communications and then the devices themselves can be proprietary. These devices can be proprietary because people have invested fortunes in their own technology and they have a right to protect their investment but that right stops at the communications link where people have a right to exchange information freely without being forced to use one certain vendor.

### **The Transforming Effect of Technology on Road Pricing**



## *Ted Hull-Ryder, ETC Corporation*

We have worked on six HOT lane/express lane/managed lane projects at this time. We are a system integrator, technology and services provider. I will primarily discuss:

- roadside technology and how it has transformed over time,
- some of the technology in place going into HOT lanes and express lanes,
- some of the technology enablers and back office solutions,
- different roadway components and elements and different capabilities in the back office; and,
- what the future holds for us.

As we looked at the traditional technology we looked at how to collect tolls. We looked at manual toll collection, the ACM (automated coin machine) environments where you had a large foot print on the roadway, quite a bit of right of way used, low throughput capabilities, low ability to have a variable price mechanism associated with it, limited visibility into the facility which actually created congestion on the roadways. Next the tolling industry moved to an AVI (automatic vehicle identification) technology environment where we have the ability to move into express lanes which can move traffic at a very quick pace and allow a more efficient collection on the roadside. In 2007, AVI technology allowed the tolling industry to collect about 67 percent of the tolls in the US electronically. The AVI technology provides the advent of moving to all electronic toll collection allowing a smaller footprint in the roadway. A smaller footprint can allow us to move to a single gantry area and still have AVI and license plate capture ability so we can enforce but more importantly add capability for non tag users to use roadway. This environment has moved the tolling industry to managed lanes and HOT lanes.

We are now seeing a combination of methods working together in HOT lane environments but each roadway will have its own approach to using multiple technologies. Changeable message signs allow you to communicate information to users before they enter the expressway or toll way. Messages can be about travel time savings, cost information and a variety of other things. We have CCTV (closed caption television) cameras and the capabilities of being able to watch dynamic message signs and watch a particular toll zone allowing toll agencies to manage the whole area more effectively. In many cases we are looking at remote traffic microwave sensors embedded in the roadway to gather traffic information effectively. This traffic information can help us determine if it is necessary to move into dynamic pricing. It is important to know what the traffic is doing not only in managed and express lanes, but also in the general purpose lanes.

In terms of enforcement there are beacons lights mounted on gantries that can communicate what type of vehicle: HOV, SOV, non-tag, etc. In-vehicle capabilities for law enforcement are also

available to interrogate tags. Other improvements for enforcement technologies have been seen with the improvements of image capture and automated license plate recognition. All of these technologies help HOT lanes run because we now have the ability to incorporate all of those technologies into the footprint of a HOT lane environment.

In the two lane environment you have the capabilities of a free flow area and there can be a zone for message signs and the zone may even have traffic sensors which can feed information for dynamic pricing. Technology can provide all of the elements for tolling: vehicle identification and classification, multiple classifications, sensors in pavement to count vehicles and sensors that can cut across the entire roadway to even read those in toll lanes and vehicles in the general purpose lanes. Bringing all this information together we can use it to develop a dynamic pricing solution in order to price and manage congestion. It important to have a strong technology solution that provides both HOT lane and general purpose lane information. Technology solutions also need to provide a predictive model to help analyze trends and predict what to expect. Technology can offer a solution to optimize systems for congestion management (if that is your goal) and one that maximizes revenue generation. Systems should handle all sorts of alternatives such as time of day pricing, static pricing and manual overrides that might be needed.

There are technology enablers out there such as sticker transponders and transponders that are switchable (a switch allows for transponder to declare the vehicle as either a HOV or SOV). The advances in image capture capabilities and OCR (optical character recognition) capabilities now allow for the fingerprinting of vehicles. These two technologies in association with transponders and the images of vehicles can allow for unique filtering in the back office that might be needed when you are doing trip combinations or developing different enforcement mechanisms. The back office arena can use software that will give different locations capabilities without the need to have all the same hardware and infrastructure for every facility. Using software can allow for the use of a single point back office for use by multiple facilities which can reduce capital, operating and maintenance costs and is proving to be more efficient.

What does the future hold for us? In the future we are going to see HOT lanes replace HOV lanes in metropolitan areas. The capacity that is there needs to be maximized from a revenue perspective. We will see dynamic congestion pricing to reduce congestion and VMT. All autos will have some sort of device to pay tolls or other premiums on facilities using pricing. Pricing is important for sustainable infrastructure and for our overall transportation needs.

## **Smartphone Application for Toll Payment**

*Mark Swank, BancPass*

I would like to touch on mobile cell phone applications for toll payment, but primarily discuss the issues and problems with toll payment systems. The industry has only seen about an 80 percent penetration of transponder tags and the penetration depends on demographics (higher in the north/ lower in the south), pricing, toll use and make up of customers. The BancPass system interfaces the toll system and the data host into a retail model to make an efficient standard retail transaction. The mobile phone application that we developed was a way to address the non-tag users and offer a way to reduce violations and to provide simple straightforward methods for customers to pay. We find that a large number of the violators are casual and they would pay if there was a simple and obvious way to pay. This is the market we are going after right now. The North American toll industry processes about 20 billion payment points annually with about 25 percent of those transactions being non-tag users, cash payments or transient users; that is about five billion transactions. We are not looking at this from a toll perspective, we are looking at this from a payment processing perspective. We are working with a partner, Chase Payment Tech, whose entire business runs five billion transactions in a year. These are the toll industry's most expensive customers and that is why we are developing applications such as the mobile phone application. It is really about making toll transactions as simple as a retail sale.

Why mobile phone payment? Phones are popular, they have increased applications, and even the non bankable people have better than a 100 percent penetration of mobile phones. Phones do not provide a simple means of interoperability; all the phone does is provide communication with the interface hub which interfaces with toll host data directly to the retail transaction network in almost real time.

How do you use the phone application? The phone application is downloaded and then the users can enter their license plate number or take a photo of the license plate to upload with the phone. Next the user can select their payment method in the application. BancPass picks up the data, exchange files with the toll authority and we guarantee payment on those files that are recognized as our customers. To a toll authority, it is a fleet account where the fleet is everyone signed up to be billed by us. The system is specifically designed so the driver does not have to do anything when driving.

The information is exchanged through the toll host's data, our interface and to the phone application. Once the transaction at the toll area happens, the phone will show that you owe a toll. The user will need to touch one to determine how they would like to pay the toll. The driver does not have to touch the phone at that moment of the transaction. The driver can do this whenever they want to do this.

We invite any toll agency to connect to us and if the toll authority picks up one of our customers, we will send the money to them almost real time. The real goal is to work with the agency to build a retail model in transaction and billing. BancPass is not a back office; we connect to back offices.

We, as a business, operate under basic business rules. Standardization for us is important, but if we need to discuss other issues concerning the interface with a toll authority we will do that. BancPass knows that the toll authority has to maintain control of the vehicle classification and rate schedules. We just take the data that is provided by the toll authority and convert the data to a retail process.

We have conducted tests in Austin through Wells Fargo Systems and in September the mobile phone application will be commercially viable. We are also talking to other tolling agencies outside the state as well.

### **Active Traffic Management on I-5, I-90, I-405, and SR 520** *Craig Stone, Washington State Department of Transportation*

How does active traffic management integrate with toll lanes? How is technology being brought to corridors? How do you have integrated corridors and provide balanced solutions? First, I want to say that the international scans do bring back technology and we do apply the technologies. For example I was on a scan in 2006 to look at traffic management technologies and WSDOT is now implementing 40 miles of active traffic management in Seattle. Additionally, a former employee at WSDOT went on a scan in the 1980s and brought back the concept of variable speed limits which Washington implemented on mountain passes on I-90 and US-2. So the active traffic management system we are using now is building off of those legacies.

Right now we are implementing on I-5 heading north into Seattle where we will have variable speed limits and lane control with 24/7 traffic management. Once you turn these on the system you are liable for what is showing up on the dynamic message signs (DMS). You are liable because the drivers start to expect something there and if no message is there, we are liable for accidents caused by the lack of information. The system is built on drivers trusting that the message on the DMS is accurate. If a warning is displayed and there is not an incident ahead, the drivers will start to not trust the system.

Where are we doing this? We are implementing this system on the south end of I-5 near Boeing Field, where we have about 600 accidents per year, into downtown. There is major congestion in this area. Each day drivers wonder where the end of the queue is and not if there is a queue. The majority of these accidents are congestion related. Most of these accidents occur during the daylight hours. This project is being implemented for safety. We expect a 30 percent reduction in injury accidents and a 15 percent reduction in property damage accidents. We are also implementing these systems on SR-520 and the I-90 bridges, as spoken about earlier. The I-5 active traffic management system will open in August 2010. The SR-520 system will open in the fall of 2010 and the I-90 system is opening in the spring of 2011.

There are two styles of DMS signs that will be used in this project. There are signs that are mounted over each lane and two side mounted DMS signs. The overhead mounted signs will

display speed limits and lane control Xs and Arrows, and will be black during non-use times. The side mounted signs will show warnings and reasons for reduced speeds. We believe from the system will pay for itself within four years just in the cost of accident savings and the delays caused by accidents.

### **Active Traffic Management on Priced Dynamic Shoulder Lanes on I-35W**

*Nick Thompson, Minnesota Department of Transportation*

I am all for scans and was on a scan in December. In Minneapolis we have the I-394 HOT lane project which was opened 5 years and 2 weeks ago. Additionally we have the I-35W corridor that has an active traffic management system and the left HOV or shoulder priced.

Technology influenced the ability of Minnesota to implement pricing. Five years ago there was no tolling in the state at all. Minnesota had a failed attempt ten years ago to implement tolling. The failure was due to the fact that people did not like the available options for paying for tolls. Five years ago technology caught up and allowed us to move forward with the I-394 HOT lane because we no longer have to use toll booths. Additionally we could not meet our performance goals of managing lanes, maintaining speeds, and maintaining free flow speeds next to the general purpose lanes because we needed variable pricing.

A hurdle we had to get over with legislators was the enforcement of the lane. Enforcement was addressed with technology through Raytheon for mobile enforcement for troopers on the fly. We replicated what we did on I-394 five years ago and added traffic management and a next generation HOT lane. We still had to build some portion of the HOT lane, as it did not take you all the way into downtown Minneapolis. We were able to build an additional four miles but funding was not available for the last two miles of lanes, so with the help of traffic management and the UPA funding we began using the left shoulder as a HOT lane during peak periods. It has been open since September. We have electronic signing giving pricing, guidance and added inroad lighting to help guide users in and out of lane. It is important drivers do not use this lane during off-peak periods so it can remain open for breakdowns and emergency use. This method was safe and a low cost way to get more capacity on our facility quickly. We were able to build out two miles of interstate within five months. We will consider these projects first when looking at building in new capacity on any of our facilities.

What have we learned from I-394? How do you control access? The HOT lane had 65 percent closed access. We redesigned access to the HOT lane allowing access almost anywhere. This is much more accepted by the customers. We have found we have a network effect going on. First we had one lane in a corridor and then two corridors close together and now we are seeing 15 percent of our customers are using both roads. We did not anticipate a bigger network. Additionally, our customers have a high expectation that our system will be interoperable with other systems. Unfortunately, we are an island of tolling; the only place that is close to us is Chicago and now our customers are asking if this system can be used in Chicago.

## Audience Questions

Who pays the fee in addition to toll? toll agency to BancPass? Do you get a markup or a discount?

*Mark Swank: It depends on rules and nature of the toll industry. Right now we have a standard service agreement. There is typically a spread between the electronic toll rate and the cash rate. Yes, we have to have a markup to pay for our service. We get a price, it is less than cash, but more than the tag holder rate.*

Minnesota is sort of a laboratory with a large range of access in the area. You have barrier separated reversible, buffer separated and the dynamic shoulder lane. What lesson is learned about access choices?

*Nick Thompson: I like to think we have five different types of HOT lanes in our corridors and they all have pros and cons, some are unique to corridor conditions. I-394 has four intersecting freeways and needs access about every two miles. I-35W is unconventional compared to what the design philosophy of HOT lanes is, especially from the federal highways philosophy. We have used more of a customer approach when designing our HOT lanes. I like to think we have proven it works, but the jury is still out. Our future toll lanes will be built more towards a much more open access than the more restricted.*

Question for Craig Stone: Do you see your lanes being as dynamic as those in Minnesota?

*Craig Stone: Yes, but it depends on the corridor we are looking at. We are doing a feasibility study on I-5 to see what happens when you change speeds so that the HOT lanes are running at a good speed while lowering the speeds of the adjacent general purpose lanes. Is this an incentive or disincentive to use the lane? Can you legally change speeds in just select lanes and where does that put you in regards to tort liability? So far we think it is compatible. We are looking at tolling every lane on US-520 with variable toll rates.*

Question to Ted Hull-Ryder and Mark Swank: You both made reference to enforcement and a balance between payment systems and enforcement. The balance being if you make it easy to pay you need less enforcement; if you make it too difficult to pay, you need more enforcement. Can you both go back and address the balance you have between payment systems and enforcement at the lane level and enforcement level.

*Hull-Ryder: Enforcement is twofold. Enforcement relative to HOV occupancy is being handled by the police in the lanes. The issue right now is how we communicate to the*

*police what type of driver they have there. We had a case where we were working with the California Highway Patrol (CHP) and we allowed them to have the ability to interrogate tags from their cars but that did not work for them. The CHP wanted lights on the gantry to indicate vehicle status. If transponders are required in every type of lane and a vehicle does not have one, you can either bill them via invoice with service charge or ticket them. Occupancy detection technology was alluded to earlier and it is almost there and we expect to be using it in the future. The best thing for the tolling industry is to have a system that is easy to use.*

*Mark Swank: We are not in the enforcement business; we are on the transaction side. We do not offer lane technology or solutions like Mr. Hull-Ryder. If someone has a transponder and we have an account for them, we pick up the transaction. We try and make payment mechanisms convenient. There are some people out there that just think they should not have to pay tolls. I am not trying to fix that problem; I am trying to address the customer that would pay a toll if they could. One way we do this is to allow our mobile phone application users to sign up after the fact. We are also working with gift card companies to have retail reloadable toll cards for cash customers off the road. We are coming up with a reloadable card tied to a license plate. All we can do is provide an interoperable standardized transaction system that will allow the toll industry to service the non-tag customers.*

Is I-35W tolled for everyone?

*Nick Thompson: No, 2+ carpools, motorcycles, and buses are free. They do not need a transponder.*

Have you had any safety issues regarding your shoulder lane usage or diminished lane?

*Nick Thompson: No, however the lane leading in will not be complete until November this year. Traffic patterns will change when construction is completed but I don't anticipate any issues.*

What is your view on a universal transportation account?

*Jack Opiola: The issue is really interoperability; where do you stop? If you are in California do you have to be worried about a customer from Virginia? There is a huge cost to interoperate or exchange data with someone. I believe in an open system, where you can bring bank customers or vendors with different technologies. Who am I to close my system to anyone?*

*Nick Thompson: We want interoperability, not just with Chicago but with our parking systems and ideally transit. We tested a concept last year where we gave away transit credits and free tolls if you signed up for MnPass. We found about 10 percent of people used both systems but the problem is both of these systems are stand alone and there is an interoperability issue. There is a cost and right now that interoperability cost cannot be justified. The only thing that is stopping us right now is operating costs.*

*Craig Stone: We have one device across the state and Oregon has been a good player with us to see how we can interact with them. We have one DOT and we are working to have one system with our ferries, so it is just a matter of how you price it and there are some Coast Guard issues. We are working with the Port of Seattle on parking. Legislators ask us when the nation will get interoperability and we can't answer that yet. Yes, we have users from California, British Columbia (BC) and the issues with being a border state. How do we handle BC plates that come through? An expert review panel came in and decided it was best to stick with plates. The good news for us it that we are new and we can create our future; the bad news is we are new and we do not have a lot in place yet.*

What can you tell us about interoperability from the lane level?

*Ted Hull-Ryder: We have some levels of interoperability right now. In Washington state now, there are two protocols of tags being read now. There is the CVISN protocol (used by the trucking arena) and a more standard protocol, so we see some interoperability there. We see regional interoperability in the State of Texas but the capabilities are confined within the Texas border and are not interoperable with the surrounding states; we see the same thing in Florida and elsewhere. We have the technical ability for interoperability with AVI tags if we can get beyond some of the business rules and some of the potential litigation associated with that, but the one thing we do have is license plates. I see license plates as an immediate capability of being interoperable. So that toll customers can have an account that is associated with a license plate that could be shared across regions. However, there is not that big of an operational incentive now to do that.*

What is your view on interoperability from being technology agnostic?

*Mark Swank: We have no control from a business perspective; it is not our side of it. We are prepared for the plate migration but we recognize that the embedded tag base is going to be there a while and we are going to have to support that also. In regard to interoperability, we have developed a standardized interface on a payment system which is being tested this month with New York State Bridge Authority. One of the requirements*



*for this system is that they test and certify our standards interface which has been released on an open architecture license through Omni Air and we are also talking with the Alliance for Toll Interoperability (ATI). We are not demanding that everyone use our standard, we are trying to promote creating an interface standard for the toll road industry so we can interconnect. British Columbia invited us and is interested in our payment interface.*

Jack Opiola: Some people say we cannot solve interoperability on the state level. Some people think it needs to be done on the federal level by enacting new legislation or dictating a standard but many people from the industry do not want the interference. At the same time there are things that can be done right now, i.e.: license plates. The National Law Enforcement Exchange (NLEX) has license plate information but unfortunately a toll transaction or violation does not fit the description that will allow us into NLEX information unless there were multiple occasions where you can call it fraud. In that case you could go to NLEX on a violation and obtain the information. Is interoperability something we must address now?

*Ed Regan: Everyone developed his own system and did not think about interoperability. The result is that the industry set the standards. It would have been nice if everyone had gotten together and formed one central clearinghouse and one communication interface that all the vendors could work with and then add their own bells and whistles to. If the industry would have set that standard, it would have been better off, but it did not happen and now we have to solve that problem after the fact.*

*Bob Poole: I would like to mention the cross border systems between Canada and the US which is Highway 407 in Toronto. It was the first all electronic controlled billing toll road. Even without a transponder they bill through a license plate image agreement with State of Wisconsin Motor Vehicle department. Canada also has that agreement with other states.*

**Friday, June 4, 2010**

**SESSION 5**

**The Future of Pricing and Potential New Applications**

Moderator: *Bob Poole*, Reason Foundation

**Federal Perspective on Future Road Pricing**

*Wayne Berman, Federal Highway Administration*

I would like to give the federal view on the future of road pricing. It is hard to look at the future without looking at where we are today and the lessons learned before determining our future. SAFETEA-LU has provided legal authority for the federal sector to provide tolling and pricing on highways. We have financed construction, reconstruction, efficiently reduced traffic congestion, and improved air quality. These six programs are available:

- Express lanes demonstration program (managed by myself),
- High performance vehicle facilities program (Jesse Yung),
- Value pricing pilot program (Angela Jacobs),
- Interstate system construction toll pilot program (Greg Wolf),
- New interstate construction co-pilot program and interstate reconstruction co-pilot program (Greg Wolf); and,
- Section 129 toll agreements (Greg Wolf).

Programs 4-6 are all managed by Greg Wolf from our Office of Infrastructure. Patrick DeCorla-Souza leads the tolling and pricing team which heads all of these programs. Patrick is the go-to-guy to express interest in tolling and pricing. We try to organize ourselves to support state and local efforts to advance pricing.

The types of priced lanes we have discussed at this conference include HOT lanes (with HOV 2, HOV 3 lanes) and express lanes. The different between the two is a very minor nuance: where in the HOT lanes HOVs go free and in the express lanes the HOVs could be charged a fee. Whether HOVs are charged or not depends on the program and the nature of the project.

We have a number of operating HOT 2 lanes around and another coming on line soon on I-110 in Los Angeles. We toured Houston's HOT lane yesterday. There is the new I-95 express lane program in Miami that went from and HOV 2 to an HOV 3 which was part of the urban partnership program. Another number of larger projects are in the process of being built: the I-495 HOT lane in north Virginia, another partnership in Atlanta, the one in Los Angeles on I-10 and the extension of I-95 are all urban partnership projects. On the express lane side there is SR-

91, I-95 in Baltimore which is under construction now, the I-595 project and a number of others all supported in our express lane demonstration program.

Priced lanes and pricing have come out of the closet and it is no longer a discussion among academics. Pricing is here, it is being implemented and it is real. There are toll lanes and express lanes that are operating and lanes that are under construction. Most of the experiences are with the conversion of HOV facilities to HOT facilities. These transitions allow a shift from congested lanes to tolled lanes but limits the degree of shifting by pricing. These projects preserve or incentivize transit and carpool use. These congestion pricing projects have been valuable because the public has seen them developed and seen them work. Now the public is more accepting of them and willing to develop them. The projects have:

- shown that reliable travel times are possible;
- shown priced lanes enhance public transportation;
- shown the public that there really is a choice and everyone can use the priced facilities;
- demonstrated technical feasibility;
- shown a change in travel behavior;
- proven that travelers are happy to have the option to buy into a reliable trip. When they see advantages, they are happy to support it and use it.

What have we learned is that these projects affect behavior, volume, and speeds. There was success with the I-15 project in San Diego that increased usage. The SR-91 express lane is a good model that shows these projects work.

Transit ridership is a key piece of the pricing concept. We have seen in a study of our New York that 20 percent of riders shifted to transit after variable pricing was implemented. The express lanes on I-95 in Miami also showed an increase in transit use with the pricing program.

Although air quality is an important issue, it has not been studied to the extent that we would like to see it done. We believe that because there have been increased benefits to the traffic flow, there are indeed opportunities to calculate improvement to air quality as a result of the pricing programs. There is public acceptance as shown in the San Diego and Minnesota experiences.

When people see that it works people generally support it. Initially, equity issues would come up before lanes are built. The HOT lane conversions were seen as being built for the rich but these concerns diminished as they began operation and it was seen that anyone can benefit from them especially when there is good public transit system available. We have seen technology development that has occurred with the advance of these pricing programs.

Where do we go in the future? Reauthorization is out there. The long term future in pricing is unknown, but in the short term I think there will be more HOT lanes and express lanes tied with transit especially with BRT services like in Tampa. Networks of priced lanes will be emerging like in Seattle, Miami and Minneapolis. Pricing strategies will become more a part in the metropolitan planning process. We may see more priced shoulder lanes as in the Minneapolis

experience. In the long term there will be the move towards full facility pricing. We have seen a little of this with the I-520 project in Seattle and the inter-county connector in Maryland. There are lots of benefits with full facility pricing but it is still unacceptable at this time. I believe there is potential for it in the future. The most important thing to leave you with is that planning for congestion pricing is the most important thing for areas to do.

## **Arterial Managed Lanes**

*Chris Swenson, Wilbur Smith and Associates*

We are going to talk about how you manage arterial lanes in the same way as managing freeways, even though there are a lot of access points on arterials. Why manage arterials? This started through the Office of Operations with Wayne Berman and staff. We know that in the metropolitan areas freeways are over-crowded and people are already moving to the arterials. We even see this in small to medium size areas such as Lee County where the arterials are the backbone of the transportation system more so than your limited access facilities. So there is a real need to price arterials even in smaller areas.

We need to look at efficient priced capacity to keep new lanes uncongested and improve services. We have to get the message out to the public that priced lanes offer much greater throughput; that we will not be robbed of our capacity during the peak hour, when we need it the most, if we are pricing at a level to manage those lanes. Self generated revenue means we can do projects.

We know how to price for a limited access facility, but for arterials we manage through queue jumps. Queue jumps recognize that arterial capacity is defined by intersection capacity. A grade separation queue jump, allows for the bypass of the traffic signal. The driver has the option to take the queue jump and pay or stay in the traffic and face the congestion. The way the queue jump works is that the lane itself becomes a natural collection point with all electronic tolling. Queue jumps can be over passes or underpasses. Bob Poole suggested queue jumps could be underpasses and I told him, sure if we issue everyone a submarine. We have found that underpass queue jumps can be a viable idea and the cost was not that much greater than over pass construction and drainage was not an issue. Hurricane evacuation is not a problem because the weather is usually fine prior to a storm and we are given ample warning, usually 24-72 hours notice, of a storm.

Benefits of queue jumps versus standard lanes:

- they are self-funding through toll revenues;
- they create a greater capacity from existing lanes;
- the right-of-way takes are not as bad;
- you don't have to add an additional lane anywhere except the intersections;
- they facilitate region-wide high speed bus rapid transit; and,

- reduce congestion for all drivers, not only those who take the lane but those who do not and those on the cross streets.
- they are not as restrictive as full limited access facilities.
- queue jumps obviously lend themselves to networks.

The synergy of queue jumps, bus ramps and transit creates the opportunity for virtual exclusive busways (VEBs). The facilities should have pricing limits that allow flow to what is comparable to a level of service C, just like on managed lanes. It is important to remember that the lanes between these queue jumps can handle a lot of traffic; the delays on roadways come from the intersections, not the roadways. A reliable uncongested speed is sustained due to long term effects of pricing.

We are also looking at the feasibility of VEBs. A VEB facilitates a region-wide high speed express bus service. In small to medium urban areas fixed rail gets to be an issue because you don't have the density to support it. These small to medium urban areas would benefit from queue jumps to promote BRT.

How much do queue jumps cost? The basic queue jump is \$35 million. The 5.6 mile example corridor has six queue jumps and the total cost of the project came in at \$277 million. The cost was higher in our project due to real world problems such as intersections being too close together, rail road tracks close to the intersection and other factors that made us extend the length of the queue jump. The project did not require a lot of additional right of way.

What are the revenue assumptions? The peak hour toll is \$0.45 in 2007 dollars. The shoulder hour (hours just before and after peak hours) toll is \$0.35. The off peak toll is \$0.20 and the weekend toll is \$0.25. There is a 60 percent peak usage rate and drivers are gaining 2-3 minutes per queue jump. There are about 50 percent shoulder hour tolls, 35 percent off peak tolls and 40 percent weekend tolls.

We assumed our typical operating costs at 20 percent of our revenues, which we think is high. Overpass queue jumps operating cost is 30 percent. Underpass operating cost is obviously more because of possible drainage issues. Consumer Price Index at four percent, discount rate at six percent, total revenue over 30 years is \$790 million and that gives the project a present value at \$285 million.

In closing, former Secretary for Transportation, Norma Mineta, said "congestion is not a scientific mystery" because we know what causes it and we (in this room) know how to get rid of it. It is not an uncontrollable force, but it has resulted in some poor policy choices and a failure to separate the solutions that are effective from those that are not.

## **Tolled Truckways**

*Annie Nam, Southern California Association of Governments*

The Southern California Association of Governments (SCAG) comprises six southern California counties and has 189 member cities. SCAG is the largest MPO in the US in terms of population and square mileage, serving 18.6 million people and 38,000 square miles. Four of the top 30 US gateways are located in Southern California including the Port of Los Angeles-Long Beach. SCAG regional population is expected to grow by nearly six million more people by 2035. The San Pedro Bay Ports recent cargo forecast projects reaching 43.2 million TEUs (twenty-foot equivalent units) by 2035. These are recently updated projections. SCAG's recent warehouse demand and supply analyses show that port and non-port related demand will absorb available space (suitably zoned vacant land) by 2028. By the year 2035 warehouse space is projected to be short by 288 million square feet. Additionally, segments of our highways are facing substantial truck volumes. Projections show volume as high as 90,000 trucks per day on some corridors.

The 2008 Regional Transportation Plan included the regional toll truck lane concept with a dedicated and separated toll truck lane system from the Ports of LA/Long Beach along the I-710, and extending further east and then up along the I-15 (to Victorville)— linking the ports to major warehousing and distribution centers further inland. An alignment for the east-west corridor is still in the process of being further defined. Nevertheless, the initial segment of a potential regional system has progressed with an Environment Impact Report (EIR) and Environmental Impact Statement (EIS) currently underway for the I-710. Financial feasibility may be a significant issue for implementation of a system as costs are estimated to be significant.

How can road pricing and truck tolling systems help? The region has taken a serious look at pricing/tolling as a means to facilitate financing. SCAG looked at the potential benefits of a truck tolling system by conducting a very high-level analysis using the SCAG Regional Travel Demand Model to generate year 2030 estimates of truck toll facility demand. SCAG employs a separate model component for Heavy Duty Truck trip generation and distribution.

We assumed a per-mile toll cost (based on average rates for express lanes throughout the region), estimated travel time savings, buffer time savings (depending on the likelihood that unexpected traffic or accidents would increase the typical trip times, a factor was added for trip planning time or “buffer time” to ensure that goods reach their destination on schedule), and an estimated industry value of time to assess capital costs recovery—assumed at \$73 per hour. Using this model, the 2030 time period was used to estimate the impact on time and reliability if separate truck lanes were built. The model compared this situation to that faced by cargo carriers if no transportation projects other than those currently planned were built. Savings were measured in terms of *travel minutes saved* as well as *planning minutes saved* due to not making such large contingency or buffer allowances. The time savings in minutes were converted to fractions of an hour and multiplied by \$73 to estimate the cost savings to a shipper from having the separate truck lanes available to them.

The estimated potential value ranged from \$103 for a trip from downtown to the port, up to \$345 for a trip from the port up to Victorville—suggesting that truck lanes could potentially offer shippers and trucking companies a significant value proposition. This analysis was conducted a few years ago and at a high-level. We are continuing to conduct extensive outreach with industry representatives to obtain more data and to refine some of the analysis.

Additionally, SCAG is in the process of releasing the updated Port and Modal Elasticity Study. Findings to date provide critical information about the implications of pricing on the industry. Although pricing scenarios evaluated involve fees in the form of levies on containers rather than tolls, the cost of transport more generally can have significant impacts on the freight industry—most notably our analysis focused on the potential for cargo diversion from the Ports of LA/Long Beach (San Pedro Bay ports) due the imposition of hypothetical container fees.

Compared to the 2005 analysis (Phase I study), the elasticity of imports via San Pedro Bay to potential container fees increased markedly due to unfavorable changes in transportation rates, including aggressive rate competition from other North American ports. The analyses of various scenario runs highlight several key points as follows:

- The elasticity of imported cargo to potential fees is much more sensitive than previously thought.
- There are disparate elasticities depending on the various categories of import volumes routed via the San Pedro Bay Ports.
- The three basic categories of imports include: (1) local imports, consisting of imports consumed within the greater region (southwest region) (2) direct-shipping imports (Inland Point Intermodal or IPI), consisting of imports destined to other regions which simply pass through Southern California while remaining intact in the marine box coming from Asia; and (3) trans-loaded imports, which are imports consumed in other regions that are unloaded from the marine box in Southern California, possibly receiving value-added services and ultimately re-loaded into domestic containers or trailers for re-shipment to other regions.
- There are various factors that could considerably impact the elasticity of imported cargo, e.g., transportation rates, market share of large nation-wide retailers in Southern California, and infrastructure investments.
- Infrastructure improvements (such as the regional trucklane system) that reduce the container travel time may be a value proposition for the trans-load business (large, nation-wide importers and importers of high-value goods).

A number of studies are currently underway at SCAG, including our Comprehensive Regional Goods Movement Strategy and Implementation Plan—to develop a detailed goods movement action plan for the region. As a part of the effort, SCAG is also analyzing the impact of pricing in more detail, including road pricing, on commercial vehicles—to consider how shippers and commercial vehicle operators may respond to pricing proposals and how these responses may affect the transportation system and economic outcomes.

## **A New Approach to Freeway Congestion Pricing** *Bob Poole, Reason Foundation*

I will discuss the politics of freeway congestion pricing, as in whole-freeway pricing. Why would it make sense, and why is there such political opposition to it? In principle, there is a strong case for pricing. There is a large supply and demand imbalance on the freeway systems in our large metropolitan areas. Pricing can reduce or eliminate congestion during peak periods, generate revenue, and target investments to areas where additional capacity is most needed, particularly where bottlenecks exist.

But there are serious political obstacles to charging for something that has always been “free.” In Pennsylvania, when the state wanted to put tolls on Interstate 80, highway users and trucking groups mobilized and fought very hard to stop tolling. They argued it was double taxation or “paying twice.” Elected officials take this very seriously, in part because 91 percent of U.S. households have one or more cars, with most having two or more. That means “voters” equals “motorists.” Putting a price on an un-improved freeway can be seen as monopoly pricing (exploiting people).

Federal efforts to promote road pricing date back to UMTA (Urban Mass Transportation Administration, the predecessor of the current FTA) which made planning grants for road pricing back in the 1970s. They offered more money to cities that would implement pricing but got no takers. After the Value Pricing Pilot Program began in the 1990s, one grant to Los Angeles funded a 50-member task force to consider peak-period pricing on the freeways in Los Angeles. After one and half years of planning and discussion, including traffic and revenue modeling by Wilbur Smith Associates, the group concluded there was no chance to do this (politically), so our “second-best” recommendation was to move forward with HOT lanes. As you may know, there are still no HOT lanes in Los Angeles County; however, two HOV to HOT conversions are now under way, 15 years later. So you can see how long it has taken to overcome political opposition even to that limited form of pricing.

The Urban Partnership Agreements program a few years ago was based in part on hopes within the Office of the Secretary that one or more jurisdictions would propose pricing an existing freeway--but no one bit on that. The only place that proposed pricing existing capacity was Manhattan, but that fell through. The I-520 bridge project will toll the bridge but only to pay for a new bridge, so that’s really new capacity, not existing capacity. Overseas we have only seen three successes in 30 years: Singapore, London, and Stockholm, with many more failed attempts, such as Hong Kong, Cambridge, Manchester, and The Netherlands. All these overseas cities which have lower car ownership, better transit, and denser land uses than nearly all U.S. cities, but it’s still very difficult to put pricing on their roads.

In thinking about political opposition, we need to face up to the reality that congestion pricing will produce losers as well as winners. The people who pay the tolls will be winners due to time



savings. Some people will be losers because they would not use the facility if they have to pay and will divert to the arterials (because in most spread-out cities such as Houston and Dallas transit is not a viable option for them). Another set of losers will be the existing arterial users because the “tolled-off” will add to the existing congestion on arterials. So, overall, the losers would probably be a larger group than the winners. Because congestion is so high in areas that need pricing the most, the prices needed to restore free flow would be very high. And if the revenues are not used to expand the freeways and eliminate bottlenecks, customers will feel they are facing monopoly pricing and will oppose it. That’s especially true in places where transit is not a viable option for most people.

There have been many proposals for overcoming political opposition to pricing. Ken Small, a researcher at the University of California at Irvine, in 1992 suggested using most of the revenues as tax rebates and about one-third of the revenue for transit and highway improvements. Most other proposals suggest using revenues to expand transit. But in most U.S. metro areas the transit mode share is five percent or less, so even if transit were doubled, this would still leave 90 percent mode share on the highways. Right now, the average door-to-door transit trip in the US takes twice as long as the average single-occupant vehicle trips, even with the current state of congestion.

It is time to rethink the model we have in our heads about how we would price freeways. I want to question two assumptions in our standard model: the single-price assumption and the GP lanes assumption. The single-price assumption is that the same variable price would apply to all vehicles. But Ken Small and others have found there is a huge variability in both value of time and value of reliability. Charging a single price is not going to get it right for most people. A single-price system will most likely charge too little to people with high values of time and reliability and too much to those with low values. Obviously a freeway cannot have hundreds of prices but a two-price model is workable--a premium price for those who have a high value of time and reliability and a much lower price that still spreads out the peaks for everyone else. When Small and colleagues modeled that, it produced much greater social welfare than a single-price model.

The GP-lanes assumption is based on the standard engineering case for GP rather than specialized lanes. A multi-lane road has a higher throughput than one with physically separated lanes because faster vehicles can pass slower-moving ones in a multi-lane context. If you decide to have specialized lanes you cannot have 1.5 lanes for trucks, you either have one or two lanes. But we have learned with HOT lanes that a special type lane in certain situations can be kept full and flowing, thanks to pricing. And there are even special cases where it looks as if exclusive truck lanes would be justified.

Pulling these points together, I believe our revised freeway pricing goal should be:

- Premium lanes with premium prices that essentially offer a money-back guarantee of Level of Service B or C at rush hour;

- General purpose lanes with modest peak pricing, designed to spread out the peaks; and,
- Truck lanes in select corridors (and only select corridors), with truck-specific pricing.

I think this scenario would produce more winners than losers. And therefore this scenario stands a better chance of happening than the single priced systems we have in our heads right now.

This two price system can and should be introduced in an evolutionary approach where each step is justified solely on its own merits, with no announced plans for any further steps, unless support develops for those steps:

- Step 1: We expand on early HOT lanes to create HOT networks, mostly one-lane-per direction, converting existing HOV lanes and adding missing links and flyover connectors at interchanges. There will be considerable capital costs because there are a lot of links to fill in and flyovers to build.
- Step 2: After the HOT network is functioning and people appreciate its benefits, that would be the time to propose expanding it to two lanes per direction, in most cases by converting an adjacent general purpose lanes (since that would be far less costly than building new capacity, and by then people will have seen the benefits of pricing and understand that if there is more priced capacity, prices could be lower and more people could use it).
- Step 3: Once Step 2 is in place and working, at that point propose adding modest peak pricing on the remaining general purpose lanes and perhaps add a truck-only lane in a few specific corridors. Of course a truck lane would not have to wait until this step, it could come earlier.

The benefit of the evolutionary approach is that each step is justified on its own merits, and does not require anyone to commit to a future step that most people would be skeptical of at that point. This approach relies on people learning from their experience with pricing.

My conclusion is that we should understand and accept that the conventional pricing approach to freeway pricing is not making headway. But HOT lanes and HOT networks are making headway. We need to build on the current HOT successes in an evolutionary fashion, taking far more seriously that different people have different values of time and using that knowledge to develop a more evolutionary approach. The big bang approach, where the entire freeway is priced all at once, most likely will not happen. But I think the evolutionary approach outlined here has a much greater chance of being accepted.

### **Audience Questions**

We all know it is difficult to get support for pricing, yet Craig Stone with WashDOT indicates the PSRC, with a 98 percent vote, has embraced the program which will go from HOT lanes to

full freeway pricing. As Congress is trying to restrict and/or stop tolling programs, these elected officials (in PSRC) are embracing tolling systems. I think that what will drive this is that it will be revenue. I believe the very nature of our interstate system, which was the federal government paid for it, handed it over to the states and now sits there and says it is already paid for and watches it fall apart and does not want to implement tolling, is stupid. Now that the freeway system needs excessive repairs, the government has cut funding, is reducing their role in the system. If the federal government cannot solve the problems with the system, it needs to move out of the way and this could be an argument that the states could use to implement tolling. I think the idea of revenue from pricing may become more attractive to the federal government as an option. I would just like to hear anyone's comments on this idea of these contradictions in public policies.

*Annie Nam: I recently proposed pricing to the Southern California Regional Council and it did not go over well. They didn't understand why we would want to do this. I do think the revenue potential is driving some level of discussion. What is somewhat hopeful is the fact that in California we have SB 375 which requires the state to meet greenhouse gas reduction targets. Due to SB 375, we spent a considerable amount of time discussing pricing and its role in the target reductions. I think in the future there may be more of a willingness to explore various aspects of pricing beyond HOT lanes.*

*Chris Swenson: In Florida on the I-75 project (which had four free lanes) we did focus groups to look at the possibility of having two HOT lanes and two general purpose free lanes (each way) versus having only one HOT lane and two free general purpose lanes. In the groups, seven out of eight wanted the two additional HOT lanes. The one person that did not want the additional toll lane was only concerned with the additional 12 months of construction and not the toll. I'm seeing a lot of evidence that the elected officials are not always in tune with what the people want.*

What drove the PSRC to get to where they are and the elected officials to support it?

*Craig Stone: We have a legacy of steps along the way. Each of the alternative transportation plans has included a pricing idea. We have a pollution management act and a very heightened environmental culture in PSRC. The key part is there is a culture of asking, "How do you bring this together?" We also have bright individuals managing the process, who are building a consensus and posing questions to elected officials about financing. We were able to bring transit people into the process because they see the tax base revenue going down and they are looking for sustainable revenue. We were able to bring in the greenhouse gases people (Choices people) because we have a state law and they keep saying we can't keep building freeways. We were able to find common ground by going around to each subject matter expert and asking "how will you solve this?" The most promising answer would come from pricing and we found when we brought pricing*

*into the picture, it helped balance our system. We had older statesmen who were well respected start buying into the idea and started showing leadership for the idea. It was a long process of getting the support for the project. All of this movement led to the vote that provided the 98 percent support for it. There are still nay-sayers out there but there will always be some with any project. It is a combination of revenue, balance, and education that worked to convince them.*

*Wayne Berman comment: Those six programs in the federal government are confusing and limiting and in some sense hampering to pricing. There are limits to the number of slots and we cannot always decide who to give them to. My read is that at least in the urban areas it streamlines what can and cannot be priced in the urban area.*

*Bob Poole: Rather than the status quo we need to think of liberalization of programs. Right now we are still in a learning-by-doing phase.*

Did you guys study queue jumping at grade with the use of signal coordination instead of grade separation?

*Chris Swenson: Yes, there is some possibility but we did not include it in our study because in this case we felt that physical separation was necessary in trying to minimize the right of way.*

*Bob Poole: In regards to the evolutionary approach, you may only be able to do a few queue jumps at a time and maybe you could coordinate signals to work with them in order to get the project up and running. If you start with a few queue jumps, it may make it easier to convert to a more traditional system of queue jumps down the road.*

A few years ago when HOV lanes came in, the objective was to increase throughput and vehicle occupancy. We are seeing a struggle with HOT lanes because a lot of people are saying why don't you just toll everyone? What is the future and role of pricing in encouraging increased vehicle occupancy? Does pricing have different objectives now? Should we try to get off of the whole HOV system?

*Chris Swenson: We are looking at moving people from one place to another, not cars. There are two hindrances with the high occupancy factor. The first is that we do not have the technology to enforce occupancy verification but we do have the technology to toll (which is easier). Right now it is not efficient to manage high occupancy lanes, so right now we are headed towards managed lanes instead of HOT lanes. I think when the technology comes around we will be able to put the "HO" (high occupancy) back into HOT lanes. The second thing is that I think we have another mode that pricing is pushing us into is the electronic mode. I am talking about telecommuting. People will*

*stop and think, if it is going to cost me more to get to work, do I really need to be there? Telecommuting is a greener approach and a more cost-efficient approach. I think that until we can double transit and add a lot of remote working, we really won't be able to implement pricing completely.*

*Bob Poole: We have gotten a lot better documentation in the last couple of years that shows that two person carpools are largely family members not reducing vehicles off the road. We should encourage more vanpools and express buses in response to priced lanes because these modes could reduce the number of vehicles on the lanes more than the existing carpools.*

*Wayne Berman: We have not generated the carpools to fill the lanes. If we had promoted more employer-based programs that allowed employees much more flexibility to carpool, we might not be talking about this now. It is the employer-based programs that have not encouraged more carpooling and vanpooling activity. Shared riding is stagnant and I don't see that pricing is going to change that.*

I like your phasing approach (to Bob Poole). I think that HOT lanes are causing a two class system which lead people to weave in and out and change lanes. Some studies have shown that these lanes can lead to hypercongestion. These studies suggest that it would be better to have all lanes unpriced rather than a two class system. We see now that the government is only putting in around 20 to 25 percent of the funding needed to implement new HOT lanes, so how long will it take raising taxes to accumulate enough revenue to get to the second stage?

*Bob Poole: That is a very good question.*

Pricing will change behavior. Chris, if you want people to work in their pajamas you don't have to legislate it, pricing will do that. The pitfall, it seems like, in your evolution is that you are wanting to build your new capacity as HOT. By doing this you are creating the political hurdle of taking away free use of those lanes. Why not build the new capacity as full-priced managed lanes and do the conversions from HOV to HOT?

*Bob Poole: That is what I was thinking, I'm sorry if it did not come across that way. All new capacity would be fully-priced express lanes.*