

The Impact of the Implementation of HOT lanes

Executive Summary

As congestion continues to increase in metropolitan areas, new and different approaches to traffic management have emerged. One management tool that has received increased media attention in recent months¹ is High-Occupancy/Toll lanes, or HOT lanes. This paper will 1) give an overview of HOT lanes, 2) describe the administration considerations in HOT lane implementation, 3) articulate the efficiency, equity, environment, and experience goals of HOT lanes, 4) provide a background on HOT lane projects, and 5) evaluate the success of the implemented HOT lane projects. Finally, the above analysis will be used to evaluate the effectiveness of HOT lanes in achieving its intended efficiency, equity, environment, and experience goals.

Overview of HOT lanes

HOT lanes, or High-Occupancy/Toll lanes, are defined as specialized use lanes, normally separated by barriers, open to 1) high-occupancy vehicles (carpool or transit) for free or at a discounted toll rate and 2) low occupancy (typically single occupancy vehicles) for a toll at market price.² In other words, the low occupancy vehicles are buying the right to use the HOV lane. In addition, the tolls on these lanes can fluctuate to depending on the time-of-day (e.g., peak period) or the level of congestion in order to control the demand of the lane. The emergence of electronic tolling collection has facilitated in the implementation and traffic demand management of HOT lanes.³

Administration of HOT lanes

HOT lane concept combines two traffic management tools: value pricing and lane management. Value pricing is used to calculate the market price of the road during peak period to influence drivers to change their driving patterns (e.g., switch to another corridor, travel in off-peak period) in order keep the road at efficient capacity. Lane management restricts access to certain lanes based on criteria such occupancy and vehicle type.⁴ These tools combine to form various mechanisms to administer and manage HOT lanes, which include:

- Occupancy requirements: HOVs (containing 2+ or 3+ persons) may use the HOT lane at no or reduced cost.

- Pricing systems: The pricing system may be fixed or dynamic, but the goal of the fee system is to limit the number of users willing to pay the toll. The overall pricing system will have higher tolls during the peak demand periods.
- Toll collection procedures: In order to use HOT lanes, motorists must have an electronic payment systems through transponders or a permit tag for toll collection.
- Vehicle type: HOT lanes can be restricted to certain vehicle types and may or may not include special treatment for low-emission vehicles, motorcycles, taxis, and/or trucks.
- Access point: HOT lanes are normally separated from regular lanes by physical barriers or lane markings. Often times there is only a single entry and exit point to the system.⁵

Each HOT lane implementation and proposal varies on the above management strategies, depending on local traffic management goals.

Goals of HOT lane development

Efficiency: Over the past two decades, there has been a range of success with HOV lanes. While some HOV lanes have been overused, causing congestion in these lanes and an increase in the occupancy requirements, others have been substantially underutilized. For example, in a study for the Minnesota Department of Transportation, Cambridge Systematics Inc. found that the carpool lanes in the Twin Cities are operating at “about half of their potential.”⁶ Because of this sometimes-perceived underutilization of HOV lanes, there is often political pressure to decommission the HOV lanes and open them for all use because the regular lanes adjacent to the designated HOV lanes are congested.⁷ Because of this underutilization (or perceived underutilization) of HOV lanes, HOT lanes are a way to more efficiently use space on existing but underutilized HOV lanes into more efficient and useful HOT lanes. These lanes use price to manage demand to maximize the lane capacity, which lends to an efficient traffic flow. In addition, travel time may be minimized because HOT lanes allow HOV and paying non-HOV motorists to travel at higher speeds and loosen the congestion for the vehicles traveling in the general-purpose lanes.⁸ HOT lanes also make the system more efficient by directly linking the driving and congestion cost to the driver.

Equity: Value pricing is often deemed “unfair” because it is perceived as benefiting only the wealthy, or those able to pay for the access to these HOT lanes. The Value Pricing website addresses this concern by stating, “The reality based on experience with California projects is that people of all income levels use these lanes, but very few people use them every day. The

tolls are typically in the range of \$2 -\$4. Almost anyone can afford this on the occasional days that they are in a particular hurry; on other days they simply use the regular lanes.”⁹ Opening HOV lanes to regular use would cost millions of taxpayer dollars to 1) repay the federal government for building the HOV lanes and 2) operate and maintain the roadway.¹⁰ Since taxpayers currently pay for roadways whether or not they use them, HOT lanes allow for equity in the system by charging the drivers in the HOT lanes to pay for their use of the roadway.

Environment: HOT lanes have a variety of environmental benefits. First, HOT lanes reduce air pollution and fuel consumption because they reduce the stop-and-go traffic on the roadways. Next, HOT lanes can potentially reduce the vehicle hours traveled because HOT lanes can improve the traffic flow on the congested road, which may draw off vehicles from parallel routes, improving the flow in the other corridor. HOT lanes also encourage people to carpool or use transit because of time and cost savings, leading to fewer cars on the roadway. In addition, HOT lanes reduce the need to build more highway capacity because they fill the “excess capacity” on HOV lanes that would not otherwise be used.¹¹

Experience: HOT lanes improve the overall quality of life for all user groups. The revenues from HOT lanes can be used to provide additional transportation choices, such as additional bus facilities, and faster transit trip times. HOT lanes increase trip time reliability, which allows for individuals to have consistent, reliable trip times. These lanes also allow for travel time savings because HOV and non-HOV users can decrease their travel time by using HOT lanes. Overall corridor mobility may be enhanced because “improved trip time reliability, higher speeds, travel time savings, and possible transit improvements all lead to greater mobility at the corridor level.”¹²

Background & implementation of HOT lanes

Although the concept of HOT lanes was pioneered in Singapore¹³, the Reason Foundation in their 1993 policy study first promoted the term and concept of “HOT lane.”¹⁴ Subsequently, the Federal Highway Administration adopted this language under TEA-21’s Value Pricing Pilot Program. TEA-21 amended ISTEA by including 1) the provision that allowed “any value pricing project included under these local programs may involve the use of tolls on the Interstate system” and 2) the provision that allowed states to permit “vehicles with few than two occupants to operate in high occupancy vehicle (HOV) lanes if the vehicles are part of a local value pricing pilot program under this section.”¹⁵

On December 27, 1995, the first HOT lane project opened on State Route 91 (SR-91) in Orange County, California. The SR-91 corridor was the most congested section of the freeway at the time Caltrans developed the concept to develop HOV lanes along this corridor. Funding for the HOV lanes was not available, so Caltrans formed a public-private partnership with the California Department of Transportation and CPTC to develop HOT lanes along the median of the corridor¹⁶. The SR-91 HOT lanes are a privately funded project managed by the California Private Transportation Company (CPTC), consist of four HOT lanes built in the median of SR-91, and extend ten miles. In addition, this was the first operating electronic variable toll system in the United States.¹⁷

Since SR-91's implementation, three other HOT lanes have been implemented in two metropolitan areas. In Houston, two HOV-3 facilities have been changed into a form of HOT lanes. During peak periods along I-10 West (or the Katy Freeway) and U.S. Highway 290, HOV-3 vehicles have free access and HOV-2 vehicles can purchase access, but SOVs cannot.¹⁸ In San Diego, an underutilized HOV lane along I-15 was changed to a HOT lane. This lane was opened up to SOVs willing to pay a price that varied every six minutes, depending on the congestion level in the HOT lane, while HOVs were able to use the lane for free.¹⁹

Evaluation of HOT lane implementation

The HOT lanes along SR-91 have planned for extensive evaluation of the impact of the HOT lanes. The evaluation of SR-91 includes more than five years of field observations, including observations prior to the operation of the HOT lanes, traffic measurements, vehicle occupancy counts, transit ridership, and travel surveys of current and former commuters²⁰. The evaluation found the SR-91 HOT lanes to be successful on many different levels. The study shows that the lanes had 1) an increasing number of motorists are willing to pay tolls to enjoy the benefits of "reduced travel time, improved driving comfort, and the perception of improved safety" and 2) motorists from all demographic backgrounds use the lanes.²¹ The SR-91 HOT lanes accommodate 1400-1600 vehicles per hour per lane, which is "about the same as the adjacent freeway and more than the freeway had previously accommodated when severely congested before the 91X lanes opened."²² In addition, despite the political tension surrounding this project, the success of the SR-91 project has caused CPTC to look possibly expanding outward to the east.²³

The I-15 project is also deemed a success and is entering into its seventh year of operation. In September 2001, Governor Gray Davis eliminated the sunset date on the I-15 project, and it was deemed self-sustaining.²⁴ According to FHWA, 20,900 transponders have been issued, and the traffic levels in the I-15 HOT lanes have increased from the pre-project levels of 9,200 daily vehicles. The total revenue for 2002 is approximately \$2.2 million, which is used for an express bus service, highway patrol enforcement, and the operation of the FasTrak Customer Service Center.²⁵

The I-10 and U.S. 290 projects in Houston have had some struggles with success. Since the implementation of the Quick Ride system and the 3+-carpool requirement, there is still underutilization of the HOT lanes during the 3+ carpool operating times. These projects continue to grapple with enforcement of toll collection, transponder technology, accurate pricing, and public relations.²⁶

Conclusion

On a scale of 1 (most effective) to 4 (least effective), I would rate HOT lanes as a **2** for its ability to address the four goals (or 4-Es) of a preferred transportation and land use system. All the implemented projects increase the **efficiency** of the transportation system because the lanes allow for efficient use of current highway capacity. The evaluation from the SR-91 projects shows that the HOT lanes are **equitable** because motorists from all demographics are utilizing the HOT lanes at varying times; more study of the other projects is necessary to make a general claim on the equitability of all four projects. In addition, all the implemented projects improve the **environment** by keeping current highway capacity (not widening or creating highways) and, as noted in the SR-91 evaluation, encouraging carpooling and transit use²⁷. The two projects in California have shown a positive **experience** for all user groups; if the public relations campaign is successful in Houston, then the residents of that area will better understand the goals of HOT lanes and the resulting improved quality of life. Although I have rated this policy fairly high because it achieves the policy goals on paper, the biggest problem with HOT lanes is implementation. Various HOT lane projects have been dismissed because of the assumed risks and misunderstanding of the benefits. Planners and policymakers need to clearly communicate the goals and benefits of HOT lanes in order to achieve the successfulness and benefits of current HOT projects.

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- ¹ See: Robert W. Poole, Jr. & C. Kenneth Orski. "HOT Networks: A New Plan for Congestion Relief & Better Transit." Policy Study No. 305. Los Angeles: Reason Foundation, February 2003 and
- ² State & Local Policy Program (SLPP). "Types of Pricing." Value Pricing Homepage. (2003). University of Minnesota's Hubert H. Humphrey Institute of Public Affairs.
<http://www.hhh.umn.edu/centers/slp/projects/conpric/index.htm> Accessed 25 March 2003.
- ³ State & Local Policy Program (SLPP). "Types of Pricing." Value Pricing Homepage. (2003). University of Minnesota's Hubert H. Humphrey Institute of Public Affairs.
<http://www.hhh.umn.edu/centers/slp/projects/conpric/index.htm> Accessed 25 March 2003.
- ⁴ Benjamin G. Perez & Gian-Claudia Sciara. "A Guide for HOT Lane Development." Washington, DC: Parsons Brinckerhoff & USDOT Federal Highway Administration, March 2003.
http://www.itsdocs.fhwa.dot.gov/JPODOCS/REPTS_TE/hot/chapter_1.htm Accessed 26 March 2003.
- ⁵ HOT Lane Management Strategies were obtain from: Benjamin G. Perez & Gian-Claudia Sciara. "A Guide for HOT Lane Development." Washington, DC: Parsons Brinckerhoff & USDOT Federal Highway Administration, March 2003. http://www.itsdocs.fhwa.dot.gov/JPODOCS/REPTS_TE/hot/chapter_1.htm Accessed 26 March 2003.
- ⁶ Laurie Blake. "Carpool lanes not paying off, study says." Minneapolis, MN: Star Tribune, February 26, 2002.
<http://www.startribune.com/stories/462/2618077.html> Accessed 31 March 2003.
- ⁷ State & Local Policy Program (SLPP). "Types of Pricing." Value Pricing Homepage. University of Minnesota's Hubert H. Humphrey Institute of Public Affairs, 2003.
<http://www.hhh.umn.edu/centers/slp/projects/conpric/index.htm> Accessed 25 March 2003.
- ⁸ Benjamin G. Perez & Gian-Claudia Sciara. "A Guide for HOT Lane Development." Washington, DC: Parsons Brinckerhoff & USDOT Federal Highway Administration, March 2003.
http://www.itsdocs.fhwa.dot.gov/JPODOCS/REPTS_TE/hot/chapter_1.htm Accessed 26 March 2003.
- ⁹ State & Local Policy Program (SLPP). "Types of Pricing." Value Pricing Homepage. (2003). University of Minnesota's Hubert H. Humphrey Institute of Public Affairs.
<http://www.hhh.umn.edu/centers/slp/projects/conpric/index.htm> Accessed 25 March 2003.
- ¹⁰ Laurie Blake. "Carpool lanes not paying off, study says." Minneapolis, MN: Star Tribune, February 26, 2002.
<http://www.startribune.com/stories/462/2618077.html> Accessed 31 March 2003.
- ¹¹ Benjamin G. Perez & Gian-Claudia Sciara. "A Guide for HOT Lane Development." Washington, DC: Parsons Brinckerhoff & USDOT Federal Highway Administration, March 2003.
http://www.itsdocs.fhwa.dot.gov/JPODOCS/REPTS_TE/hot/chapter_1.htm Accessed 26 March 2003.
- ¹² Benjamin G. Perez & Gian-Claudia Sciara. "A Guide for HOT Lane Development." Washington, DC: Parsons Brinckerhoff & USDOT Federal Highway Administration, March 2003.
http://www.itsdocs.fhwa.dot.gov/JPODOCS/REPTS_TE/hot/chapter_1.htm Accessed 26 March 2003.
- ¹³ Eric Scigliano. "Life in the HOT lane." Seattle, WA: Seattle Weekly, February 17-23, 2000.
<http://www.seattleweekly.com/features/0007/features-scigliano.shtml> Accessed 26 March 2003.
- ¹⁴ Robert W. Poole, Jr. & C. Kenneth Orski. "HOT Networks: A New Plan for Congestion Relief & Better Transit." Policy Study No. 305. Los Angeles: Reason Foundation, February 2003.
- ¹⁵ Federal Highway Administration Office of Transportation Policy Studies "Value Pricing Pilot Program." Washington, DC: U.S. DOT, March 14, 2003. <http://www.fhwa.dot.gov/policy/otps/valuepricing.htm> Accessed: 24 March 2003.
- ¹⁶ State & Local Policy Program (SLPP). "ORANGE COUNTY, CA (SR-91)." Value Pricing Homepage. University of Minnesota's Hubert H. Humphrey Institute of Public Affairs, 2003.
<http://www.hhh.umn.edu/centers/slp/projects/conpric/index.htm> Accessed 25 March 2003.
- ¹⁷ Federal Highway Administration. "Congestion Pricing Notes" Washington, DC: U.S. DOT, No. 1, Spring 1986.
<http://www.hhh.umn.edu/centers/slp/projects/conpric/news/spring96.pdf> Accessed 25 March 2003
- ¹⁸ Robert W. Poole, Jr. & C. Kenneth Orski. "HOT Networks: A New Plan for Congestion Relief & Better Transit." Policy Study No. 305. Los Angeles: Reason Foundation, February 2003.
- ¹⁹ Robert W. Poole, Jr. & C. Kenneth Orski. "HOT Networks: A New Plan for Congestion Relief & Better Transit." Policy Study No. 305. Los Angeles: Reason Foundation, February 2003.
- ²⁰ Edward Sullivan. "Continuation Study to Evaluate the Impacts of the SR 91 Value-Priced Express Lanes: Final Report." Submitted to CA/DOT. Department of Civil and Environmental Engineering, Cal Poly State University. December 2000. http://ceenve.calpoly.edu/sullivan/SR91/final_rpt/FinalRep2000.pdf Accessed 30 March 2003.

²¹ Edward Sullivan. "Continuation Study to Evaluate the Impacts of the SR 91 Value-Priced Express Lanes: Final Report." Submitted to CA/DOT. Department of Civil and Environmental Engineering, Cal Poly State University. December 2000. http://ceenve.calpoly.edu/sullivan/SR91/final_rpt/FinalRep2000.pdf Accessed 30 March 2003.

²² Edward Sullivan. "Continuation Study to Evaluate the Impacts of the SR 91 Value-Priced Express Lanes: Final Report." Submitted to CA/DOT. Department of Civil and Environmental Engineering, Cal Poly State University. December 2000. http://ceenve.calpoly.edu/sullivan/SR91/final_rpt/FinalRep2000.pdf Accessed 30 March 2003.

²³ State & Local Policy Program (SLPP). "ORANGE COUNTY, CA (SR-91)." Value Pricing Homepage. University of Minnesota's Hubert H. Humphrey Institute of Public Affairs, 2003.

²⁴ Federal Highway Administration. "VALUE PRICING PILOT PROGRAM SUMMARY OF FUNDED PROJECTS." Washington, DC: U.S. DOT, December 2002. <http://www.fhwa.dot.gov/policy/otps/trbpage.html> Accessed 23 March 2003.

²⁵ Federal Highway Administration. "VALUE PRICING PILOT PROGRAM SUMMARY OF FUNDED PROJECTS." Washington, DC: U.S. DOT, December 2002. <http://www.fhwa.dot.gov/policy/otps/trbpage.html> Accessed 23 March 2003.

²⁶ Federal Highway Administration. "VALUE PRICING PILOT PROGRAM SUMMARY OF FUNDED PROJECTS." Washington, DC: U.S. DOT, December 2002. <http://www.fhwa.dot.gov/policy/otps/trbpage.html> Accessed 23 March 2003.

²⁷ Edward Sullivan. "Continuation Study to Evaluate the Impacts of the SR 91 Value-Priced Express Lanes: Final Report." Submitted to CA/DOT. Department of Civil and Environmental Engineering, Cal Poly State University. December 2000. http://ceenve.calpoly.edu/sullivan/SR91/final_rpt/FinalRep2000.pdf Accessed 30 March 2003.