

FHWA Pricing Workshop: HOV to HOT

Planning Best Practices and Lessons Learned

- **Establish goals and objectives and clearly communicate a vision**

Projects must have clear objectives and a vision of how to achieve objectives in order to measure success. Determine the goals of the project and how success will be measured.

- **Take advantage of opportunities**

Several successful projects have been the result of taking advantage of opportunities whether it is underutilized capacity on an HOV lane, new legislation encouraging innovative partnerships or even popularity of an operating strategy.

- **Maintain flexibility**

Decide upfront on priority users and how or what may cause changes in this operating strategy over time. Establishing threshold values will enable operators to easily recognize when a project is not performing as intended. Knowing these threshold values in advance allows operational changes to be more easily implemented. Moreover, incorporating flexibility into the design of the facility may extend the life of the facility because operations can be adjusted as corridor conditions change or community goals change.

- **Engage project partners and encourage agency cooperation**

Successful projects have been the result of cooperative efforts from many agencies. The projects often cross jurisdictional boundaries and may require new institutional arrangements. These agreements should be drafted early in the planning process and should clearly define the roles and responsibilities of all parties. While being clear in responsibilities, the agreements should also contain enough flexibility to provide for unforeseen circumstances. Agency cooperation results in seamlessness to the customer.

Planning Group Exercise

Develop an Action Plan that identifies the steps necessary in the planning process to support the project.

What are the project goals?

Who are the stakeholders and what are their roles?

What data/analyses are needed?

What are the potential barriers?

Consider the following questions:

- What are the project goals, prioritize if necessary?
- Is project included in long-range plan and TIP? If not, how will this be addressed?
- Who are your project champions? How will they help implementation?
- What institutional arrangements are necessary? Who are the stakeholders and what are their roles? How are the existing relationships?
- Are regional pricing policies already in place?
- What institutional arrangements are currently in place?
- What operational strategies are being considered?
- What is the existing legal authority? Will additional legislative authority be required?
- Is this an interim project or will it be permanent for the foreseeable future?
- How will toll rates be set?
- What will excess revenues, if any, be used for?
- What environmental approvals are required?
- Are there environmental justice concerns? If so, how will they be addressed?
- What are the current/future occupancy requirements?
- Who are the priority users?
- How will operations be adjusted over time?
- How will performance be monitored?

Operations Best Practices and Lessons Learned

- **Develop a Concept of Operations to Guide the Process**

To begin, agencies involved should develop a concept of operations clearly outlining the roles and responsibilities for each agency in the design, construction, operation and maintenance of the HOT lanes. Many of these roles may already be in place for the HOV lane, for example, debris removal, and may require only minor adjustments. Other areas, like toll collection, will be new and require new discussions and, often, memorandums of understanding developed between agencies.

- **Determine vehicle occupancy based on current operating conditions**

HOV to HOT conversion projects are implemented mostly in corridors with underutilized HOV lanes. Those HOV lanes usually have a 2 person occupancy requirement. Therefore, HOT lane implementation involves retaining the 2 plus person vehicle occupancy requirement and selling the excess capacity to toll paying SOVs. In certain cases (e.g. Houston and Miami) with overcrowded HOV lanes, the vehicle occupancy requirement is increased from 2+ to 3+ given the already high demand of 2 person carpools. It has a direct effect on the revenue generation capacity of the HOT lanes as well as the previous users of the HOV lanes.

- **Pricing**

A dynamic pricing mechanism allows the frequent change of toll rates. The toll rates vary in order to maintain the free flow speed in the HOT lanes. There should be thresholds established for the minimum and maximum toll rates. These may be set as a per mile rate or for the total trip. However, because of its complex mechanism, it could require adjustments to adapt to the demand and the willingness to pay of the drivers. The less complex pricing mechanism of fixed variable / time-of-day pricing is also used. With a guiding principle to modify the toll rate structure, the toll structure can be updated from time to time (e.g. SR 91 and I-25 Express Lanes). However, with a fixed variable pricing, there is less flexibility to adjust to ongoing operational issues. For instance, a major incident in the GP lanes can cause a sudden spike in demand for the HOT lane. Fixed schedules don't allow for adjust to these variable conditions.

- **Toll Collection**

Location: Electronic toll collection is used with the transponder placed on the windshield. The toll collection mechanism varies based on the type of facility which can be broadly classified as - no intermediate access facility and limited intermediate access facility. With no other intermediate access points toll collection can be done at a single toll collection zone (e.g. SR 91 Express lanes) while with intermediate access points, toll collection is required at all points of access and can vary according to the point of access (e.g. I-394 Express Lanes, SR 167 HOT lanes).

Rate: Many agencies set both a minimum and maximum toll rate. The minimum often being between 25 to 50 cents per trip, typically in off-peak periods. The maximum often in the range of \$7 to \$10. If traffic remains congested even at the maximum toll rate many agencies have the ability to close the lane to toll paying customers (generally SOVs).

Refunds: Some agencies have developed business rules under which a toll refund will be given to travelers. An example would be when an incident in the HOT lane slows/stops traffic resulting in travel times that exceed the general purpose lane travel time.

- **Enforcement**

The enforcement efforts required for the efficient operation of HOT lanes also vary according to the facility. Facilities with no intermediate access points can be enforced at the point of entry or exit by having different lanes for carpools and toll paying users. To ensure that toll paying users pay the tolls, the enforcement officer often observes a beacon on the toll gantry which flashes if a transaction is made. Those entering through the carpool lane will be manually observed to ensure that they have the correct number of passengers. Adding the license plate photo technology provides the option to charge those traveling solo or as LOVs without a transponder. I-95 and SR 91 Express Lanes require all the users of the HOT lanes to purchase the transponder while in I-25 solo drivers without the transponder can be charged using the license photo technique.

Facilities with intermediate access points generally require multiple enforcement areas. Buffers generally either have flexible pylons or double white lines to separate the HOT lane from the GP lanes. Enforcement is also required to ensure that vehicles don't cross over the pylons or the double white line separation.

Enforcement can be aided by having both the carpools as well as toll paying users buy the transponders and place it on the windshield. However, only the SOVs are charged a toll. The negative side to this is the new requirement that

HOVs have a transponder to use the HOT lane – thus adding another deterrent to carpooling. Most HOT lanes do not require the HOV travelers to have a transponder.

Additional enforcement with HOT lanes can be funded using the HOT lane revenue and the state or local highway patrol officers can be contracted to enforce the HOT lanes.

- **Hours of Operation**

Determine if the HOT lane will operate during the same hours as the HOV lane did. Reducing access hours for any vehicles can negatively impact the public perception of the new HOT lane.

- **Operating Parameters / Goals**

Most projects explicitly state that their goal is to maintain the free flow of traffic on the HOT lane. The FHWA guideline is to exceed 45 mph for 90% of the peak period. Many agencies use that standard, while some use 50 mph, level of service C, or the travel time of the buses on the lane. To measure the ability of the lane to meet the goal will require consideration of monitoring and evaluation plans and equipment.

Operations Group Exercise

Develop an Action Plan that identifies critical operational issues that need to be addressed to support a successful project.

What are the roles and responsibilities of partner agencies?

Establish measures of effectiveness and thresholds for performance.

Establish monitoring, maintenance, and incident management processes.

What are the potential barriers?

Which categories of vehicles will travel for free and which will have to pay?

Determine the pricing mechanism – dynamic or variable.

Discuss the need for both a minimum and maximum toll rate.

Examine the different potential enforcement mechanisms, their locations, and the agencies involved in enforcement

Determine toll collection locations.

Consider the following questions:

- What are the roles and responsibilities of the partner agencies?
- Who will operate the facility?
- Who will handle the different operational elements?
- How will tolls be collected and transactions processed?
- How will access design work with the tolling scheme?
- What are the implications for the network?
- How will the facility be integrated into existing ITS infrastructure?
- How will the facility interface with other components of the regional transportation system?
- How does the toll policy affect operations?
- How do the priority user groups affect operations?
- How will operations be monitored?
- Will operations change over time? If so, how?
- How will enforcement be handled?
- Are the enforcement areas in the design of the project?
- When a violation occurs, what will be the fine?
- How will the fine be processed?
- What agency will be responsible for enforcement?
- Who is responsible for incident management on the facility?
- Will performance measures for incident management be defined in operating agreements? If so, what will they be?
- How will incident management be funded?
- What agency will maintain the facility?
- Will the facility have any unique maintenance requirements?
- What will be the policy for clearing shoulders or unused lanes of vehicles – other than as part of incident management?
- Who is responsible for monitoring performance?
- What will trigger an operational change? How will changes be implemented?
- Are there specific operating thresholds that must be maintained per agreements with other agencies?
- What adjustment mechanism is in place when these thresholds are not met?

Design Best Practices and Lessons Learned

Design of the HOT lanes depends mostly on two factors- design of the previous HOV lanes and available room in the corridor to make modifications.

- **Determine separation mechanism**

The three major separation mechanisms used are concrete barrier separation, flexible pylons and double white lines. The three separation mechanisms differ in terms of cost as well as the available room on the corridor required to adopt them.

- **Determine access locations**

HOT lanes can be divided in to two types of facility based on the access- HOT lanes with no intermediate access and HOT lanes with limited intermediate access. With concrete barrier separated HOV lane, there is little opportunity to change the access points (e.g. Katy and US 290 in Houston). However, concurrent HOV lanes with double white line separation and unrestricted access can be changed to facilities with no intermediate access or with limited access points. Careful consideration should be given to the placement of access points. This can have a major influence on the economic projections as well as community acceptance of the project. Weaving volumes should be carefully considered as well. Too few access points could concentrate too many weaving movements in an area. Certain high volume movements might justify direct access ramps to/from the HOT lane.

- **Assess toll collection locations and attempt to minimize**

With HOT lanes, restricted access is important in order to minimize the toll collection zones as well as enforcement efforts needed for the efficient operation of the HOT lanes.

- **Outreach to travelers about changes in access**

In case the HOV to HOT conversion leads to drastic changes in the number of access points of the HOT lanes, the HOT lane planning process should involve an outreach process to educate the previous users of the HOV lanes regarding the changes and their benefits.

- **Develop coherent signing program**

The signage is important in order to guide the HOT lane users. For a dynamic pricing the variable message signs should be installed to display the current tolls. Also, for a facility with intermediate access points, the tolls may be different depending on the point of entry. Signs need to give adequate decision making time to drivers, but yet must be close enough that information is still valid when the driver enters the lane.

- **Allow for a wide buffer separation when using pylons or paint**

A wide enough buffer (for example the 4 feet wide buffer on the SR 167 HOT lanes) should be provided for separating the HOT lanes from the general purpose lanes in case when the flexible pylons or double white line separation mechanism is used. A wide buffer may provide added safety because of the high vehicle speed differential between the HOT lanes and the GPLs. This added safety may only be a perceived improvement as too little crash data is available to make a definitive recommendation on buffer size.

- **Ensure safe merging/weaving distances with concurrent facilities**

The concurrent HOT lane facilities with double white line separation which are converted from a HOV facility with unlimited access need special attention to the design of access points. Since the previous users were used to unlimited access, the access points should be long enough to help in safe merging in to and out of the HOT lanes. Also access points should be located in order to provide logical use of general purpose lane entry/exit ramps.

- **Incident Detection and Use of ITS**

The HOT lane will need to be monitored for incidents and vehicle speeds. Many HOV lanes already have ITS devices that perform some of these functions. The addition of tolling, particularly dynamic tolling, will require additional ITS infrastructure to be integrated with existing devices.

- **Number of Lanes**

A single lane facility operates under much different operational characteristics than a multi-lane facility. In particular, if there are high volumes of busses on a single lane facility, then these vehicles greatly influence the operational characteristics of the lane.

Design Group Exercise

Develop an action plan that identifies critical design issues that need to be addressed to support a successful project.

Identify user groups and design criteria based on the group requiring the greatest flexibility (buses?).

Identify and establish fundamental design parameters of facility.

What are the costs involved in adopting the different separation mechanisms and the width of the separation?

What are the safety and access implications for different separation mechanisms?

Discuss relation of intermediate access points and O-D pattern of HOT lane users.

What are the locations and messages for signage?

Consider the following questions:

- How will allowable user groups influence design? (i.e., large trucks)
- What will be the final lane width of the facility?
- Will the facility be separated from general-purpose traffic by a fixed barrier
- Will emergency pull-outs be constructed? If so, how wide will they be, what will be their spacing, and what will be the tapers?
- How will existing drainage inlets be addressed?
- Grade-separated access versus slip ramp?
- Are there phasing issues that may influence the design? What level of flexibility is needed?
- Is there adequate ROW for enforcement? If not, how will enforcement be addressed?
- What pavement markings will be installed on the facility?
- What overhead and post-mounted informational and lane control signs will be installed?
- What messages will need to be conveyed to travelers?
- How will messages be conveyed?

Finance Best Practices and Lessons Learned

- **Ownership for the facility and right-of-way**

There is no straightforward funding mechanism for the HOT lanes. Most, if not all of the operating projects today were the result of taking advantage of opportunities. Depending on the scale of changes required for the HOV to HOT conversion, the required funding varies to a large extent from one project to another. For example, some conversions include not only the installation of toll collection zones and increased enforcement (I-15 in San Diego and I-25 in Denver) but also the addition of capacity to the corridor (conversion from one HOV lane to two HOV lanes per direction in I-95, Miami), restriping the corridor (SR 167 in Seattle and I-394 concurrent flow section) or changing the separation mechanism (double white lines to flexible pylons in I-95, Miami). In case the HOV to HOT conversion does not include huge modifications to the existing HOV facility, the project can be financed mostly by the local agencies (e.g. I-394 MnPASS was funded using a loan from a downtown parking ramp fund as well as using the private funds). If FTA funds were used to help construct the original facility, specific guidelines must be followed or funds must be repaid.

- **Available assistance through Federal programs**

Public agencies interested in implementing and evaluating HOT lane projects are eligible to apply for grants under the Value Pricing Pilot Program (VPPP). VPPP grants have been essential funding source for some HOT lane projects. However, the grants provided to the different projects varies in amount depending on whether the grant is provided for a) the pre-implementation costs (e.g. VPPP grant of \$925,000 in I-394 covered planning, outreach and education while the total project cost was \$12.9 millions) or b) the project implementation costs (e.g. VPPP grant of \$2.8 million out of \$ 9.9 million project cost in I-25 and \$2 million out of \$17.9 million total project cost of SR 167). Winning the competitive funding from Federal government has been helpful in large scale HOV to HOT conversion projects (e.g. Urban Partnership Agreement (UPA) funding for I-95 Express Lanes in Miami). However, to win, those projects should aim at comprehensive transportation solutions including the transit element along with the congestion pricing.

- **Stakeholders**

The Federal grant plays an important role in the funding of the HOT lane development. However, the Federal grant is sometimes a part of the total funding required in which case funding is supplemented by other stakeholders of the project which might involve state DOTs, (e.g. Katy, Houston) transit service providers (e.g. Regional Transit District in I-25, Denver) and toll authorities

(HCTRA in Katy, Houston), the gas tax (SR 167 in Seattle) or the private sector (I-394, Minneapolis). In most instances, funding has been cobbled together from several sources. Agreements can be made with the private operators to construct and operate the HOT lane facility and collect the revenues for a certain period of time (SR 91 Express lanes).

- **Revenue Sharing**

The demand for continued funding of a project being implemented in phases also depends on the excess revenue generated by the HOT lane (e.g. I-25 Express Lanes generated revenue exceeding the estimated revenue to cover operations and maintenance; revenue generated in I-394 was half as estimated and I-15 in San Diego generated enough revenue to fund express bus operations).

Finance Group Exercise

Develop a financial plan that will allow for the successful design, construction, operations, and maintenance of the facility.

Who owns the lane(s) and right-of-way (ROW)?

Were FTA funds used for the HOV project?

Is the project eligible for an urban partnership agreement grant or a value pricing pilot program grant?

Would having the private sector operate the facility as a PPP prove beneficial? If yes, how so?

What revenues can be expected from toll paying patrons? Who wants a share of those?

What are the ongoing operation and maintenance costs?

Can/should revenues from fines be used to help finance the facility/enforcement?

Consider the following questions:

- How will the project be funded?
- Will financing be required? If so, what financing mechanism will be used?
- If debt will be issued, how will it be repaid?
- How will construction be funded?
- How will operations and maintenance be funded?
- How will enforcement be funded?
- If excess revenues are generated, how will they be used?
- What is the potential users' willingness to pay?
- Are other innovative financing mechanisms able to be considered? (e.g. development impact fees, special assessment districts, etc.)
- How will toll policy be decided?
- How will changes in toll policy affect project financing?
- Is a private developer involved? How does this impact the project's acceptance?
- Can back-office operations be leveraged with other entities?
- What are the origin-destination patterns in the corridor? How will access design affect these?
- What are the travel characteristics of the corridor users?
- What alternative routes are available? Are there plans to add capacity to these options?

Outreach Best Practices and Lessons Learned

- **Identify project champions**

Many projects have benefitted from the support of trusted individuals in the community or state. Project champions, other than the implementing agencies, can lend creditability to the project. Additionally, if enabling legislation is required a project champion that can accomplish this is an indispensable asset.

- **Conduct market research and identify issues**

Market research should be conducted to identify what the issues are that are problematic for the community. This should include research of current HOV and transit users as well as potential users of HOT lanes. This information is crucial to develop materials and messages to educate and inform.

- **Develop clear and concise messages**

The messages that are used to communicate project specifics, including project goals, need to be clear and concise. They must clearly convey what the purpose of the project and the project implementation hopes to achieve.

- **Communicate project goals**

In many communities HOT lanes and pricing are new and complex concepts. The goals that are communicated must resonant with the public. Successful projects clearly articulate the goals of project. The I-15 project in San Diego showed how the project revenues would be used to implement new transit service in the corridor; a service that was desired by the public. Without clearly defining and communicating project goals even potentially successful projects can be killed before implementation because of misunderstanding.

- **Continue from project development through operations**

Projects benefit from continued outreach to the users and general public. It is important to continuously market the project. Market research conducted throughout the life of the project allows agencies to adjust messages as needed to address concerns. The public also needs to be kept aware of how operational changes may occur over the life of a project.

- **Create brand awareness**

In some communities it may be necessary to distinguish a HOT project from other tolling projects in the area. A different brand may be used for this purpose. If this is not the cause, it is still useful to promote project awareness.

Outreach Group Exercise

Develop a communication/marketing plan that will support project implementation and operation.

Outline sequential steps in outreach plan.

Who are the stakeholders?

What are the most appropriate communication methods? Will they vary throughout the corridor? If yes, how so?

What messages need to be communicated?

Who are the appropriate messenger(s)?

Consider the following questions:

- What are the area demographics?
- Are there currently operating HOV lanes in the area? What is the public's acceptance of them?
- Are there currently operating toll roads in the area? What is the public's acceptance of them?
- How does the public feel about current toll rates?
- How does the public feel about the level of service on the toll roads?
- What is the toll tag penetration rate?
- What is the public's trust level with the agency implementing the project?
- How will the public react to a private developer implementing the project?
- Will there be confusion over which agency is implementing and/or operating the project?
- Has there been previous media attention on pricing/transportation funding?
- What are the equity issues associated with the project? If any, how will they be addressed?
- Are there project champions? How can the project champions be used to garner support for the project?
- Is there known opposition to the project? If so, what are the issues and how might they be addressed?
- How will the project be marketed?
- Will marketing continue throughout operation of the project?