

HOV LANE PERFORMANCE PROJECT

JUNE 23, 2009

HONOLULU, HAWAII

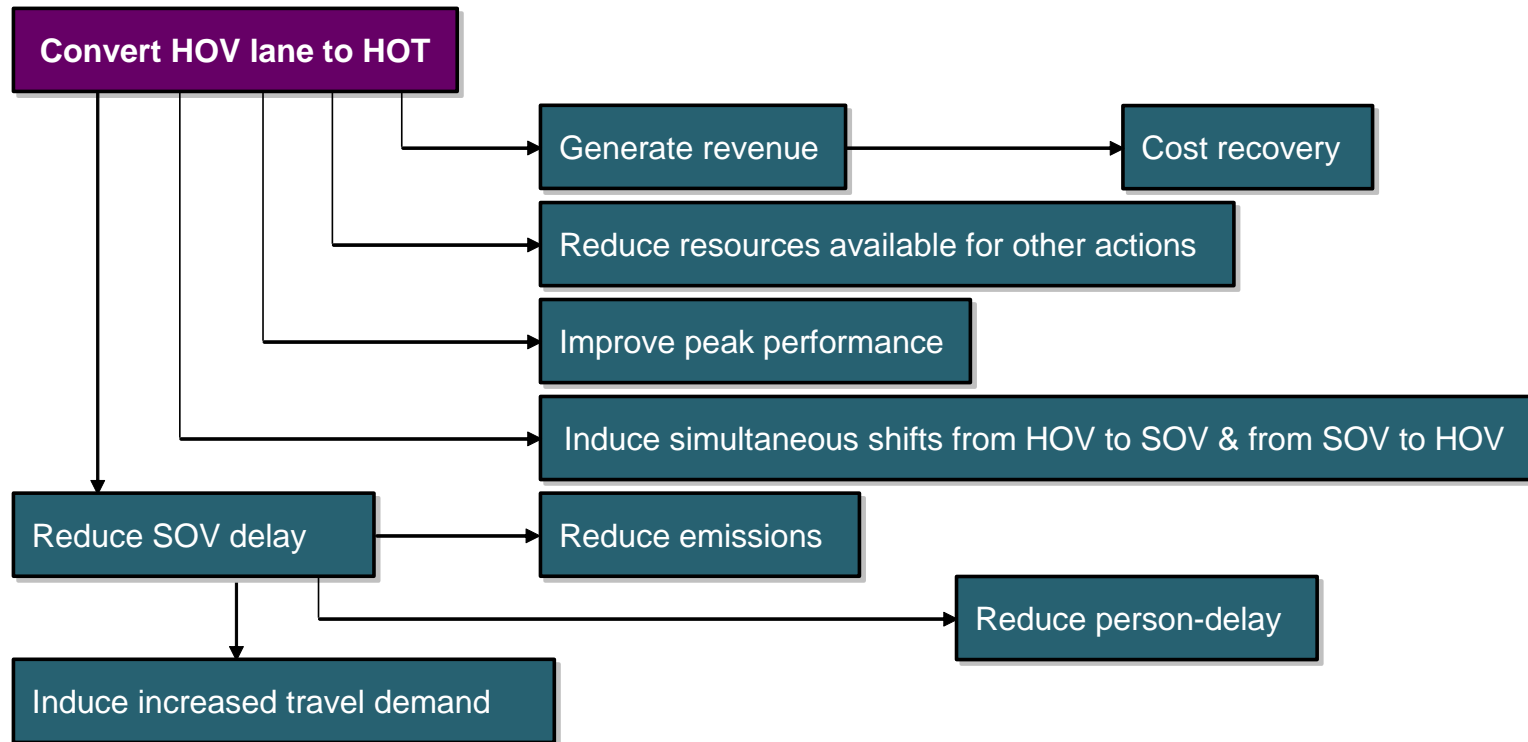
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Agenda

- ▶ **Purpose of the Research**
- ▶ **Outreach to HOV Operators**
- ▶ **Development of POET-ML**
- ▶ **Questions and Answers**

HOV lanes and HOT lane strategies

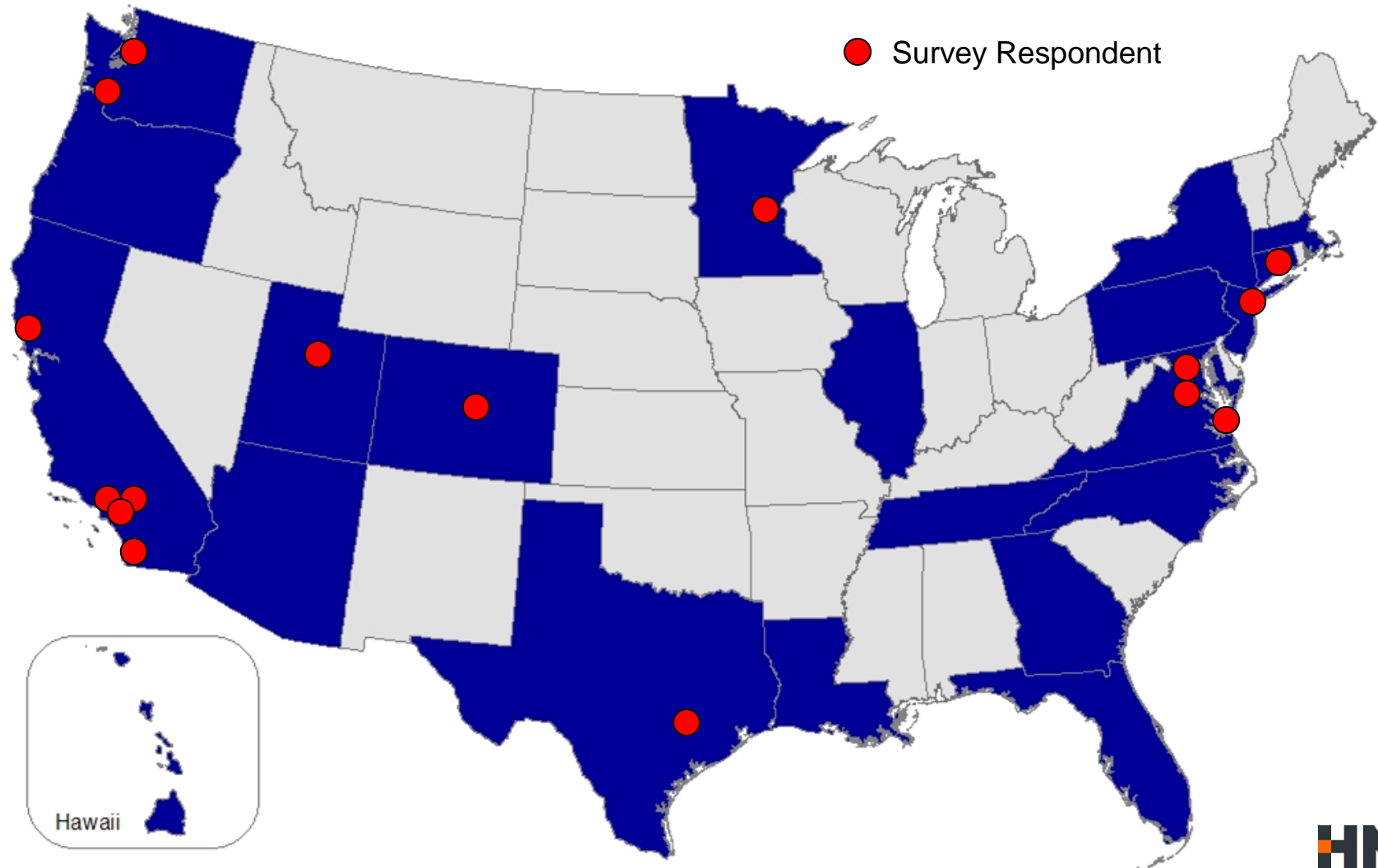
HOV Lane performance is perceived as mixed -- and with the maturing of ETC technologies and pricing techniques, ranging from flat toll to dynamic by time of day, a range of options are available to improve performance, including HOT applications...



Research objectives and overall approach

- ▶ ***The study is to profile HOV lane performance and results (from an objectives standpoint), and to develop a better understanding of the policies, conditions, and performance factors that might make HOV lanes suitable candidates for conversion to HOT lane operations.***

HOV performance assessment U.S. States operating HOV facilities



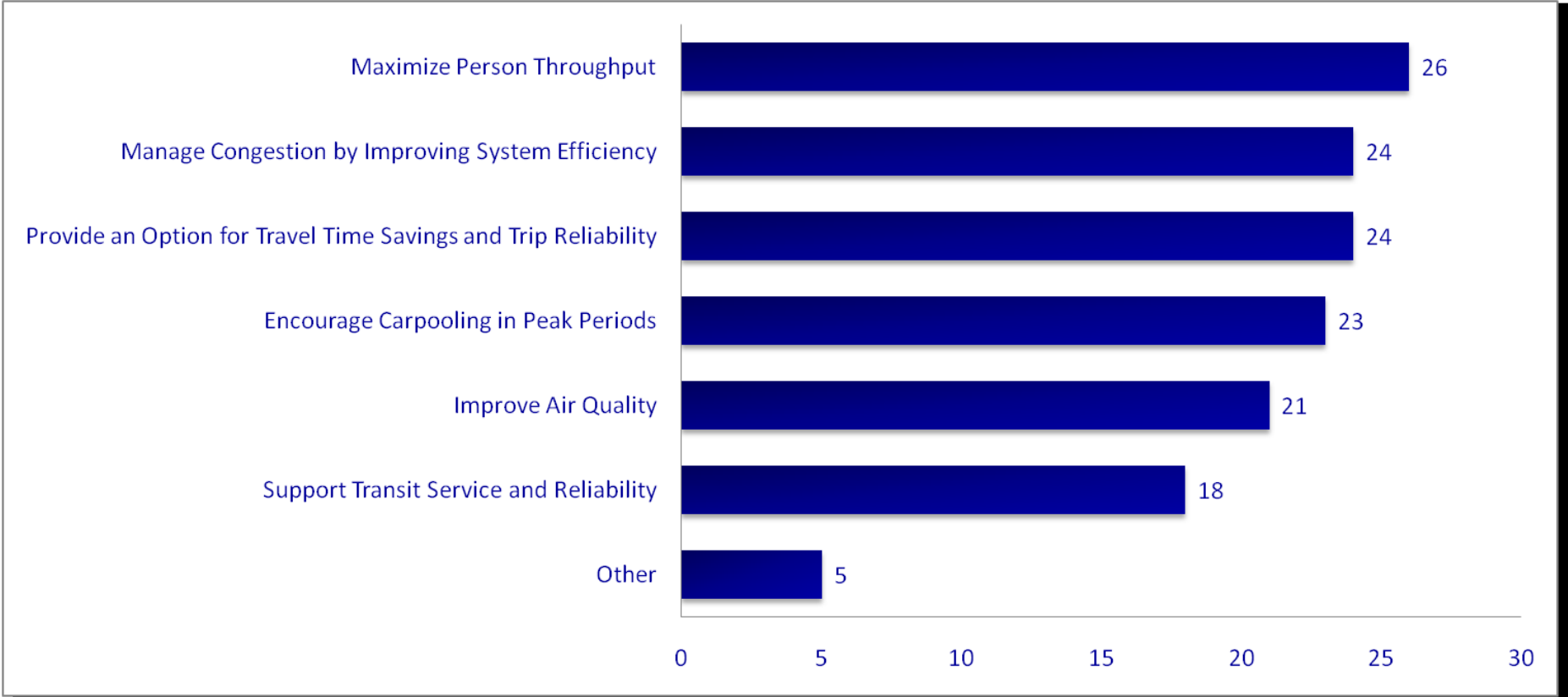
HOV Performance assessment – Respondent profile

- ▶ **28 Respondents representing 10 states and about 73 HOV facilities**
- ▶ **7 Currently operating HOT facilities**
- ▶ **3 Planning / constructing HOT facilities**
- ▶ **3 Private consultants**
- ▶ **1 Arterial HOV facility operator**

HOV Operators were asked to provide information regarding the following:

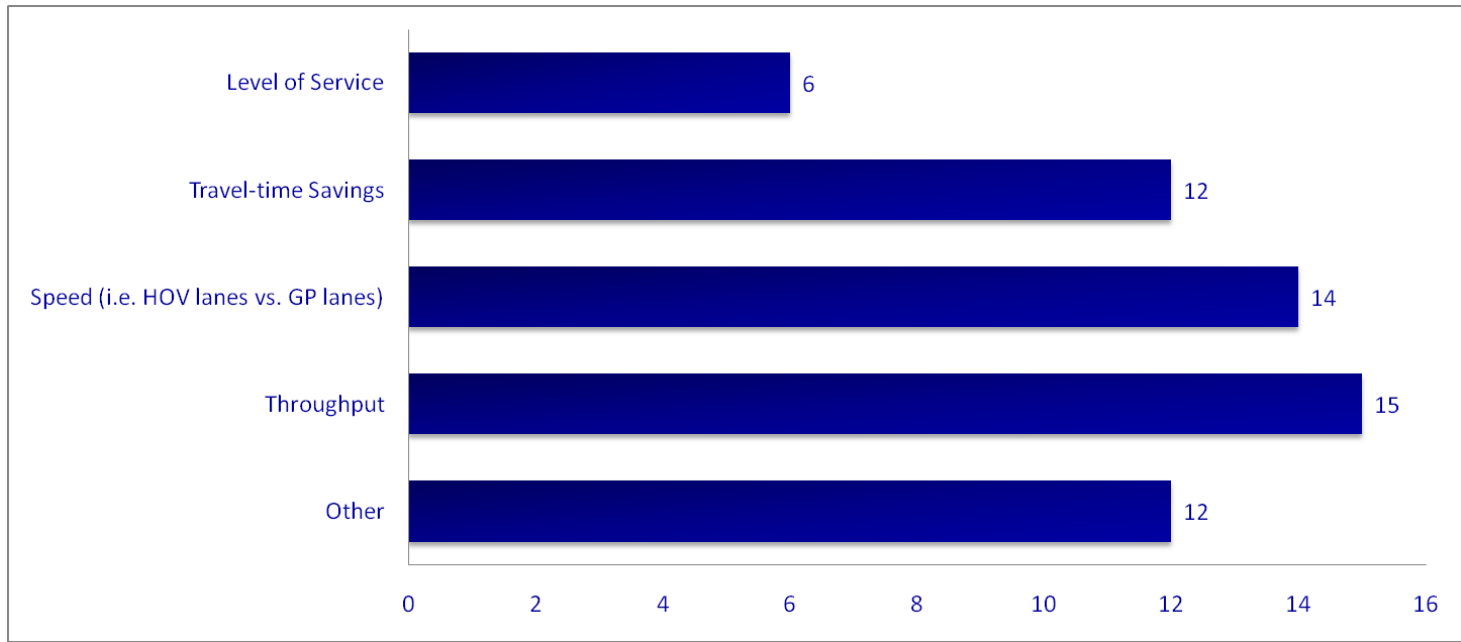
- ▶ **Why did you add HOV lanes / What are your HOV system goals?**
- ▶ **What performance criteria are you using to monitor the performance of your HOV System?**
- ▶ **Are the HOV lanes meeting your performance objectives?**
- ▶ **Do you have plans to revisit the goals of your HOV system?**
- ▶ **Have any policy changes been made to your original HOV system? Are you considering any in the future?**
- ▶ **Do you have HOV performance data you are willing to provide?**

Why did you add HOV lanes in your region? What are your HOV system goals?



Are you monitoring the performance of your HOV system?

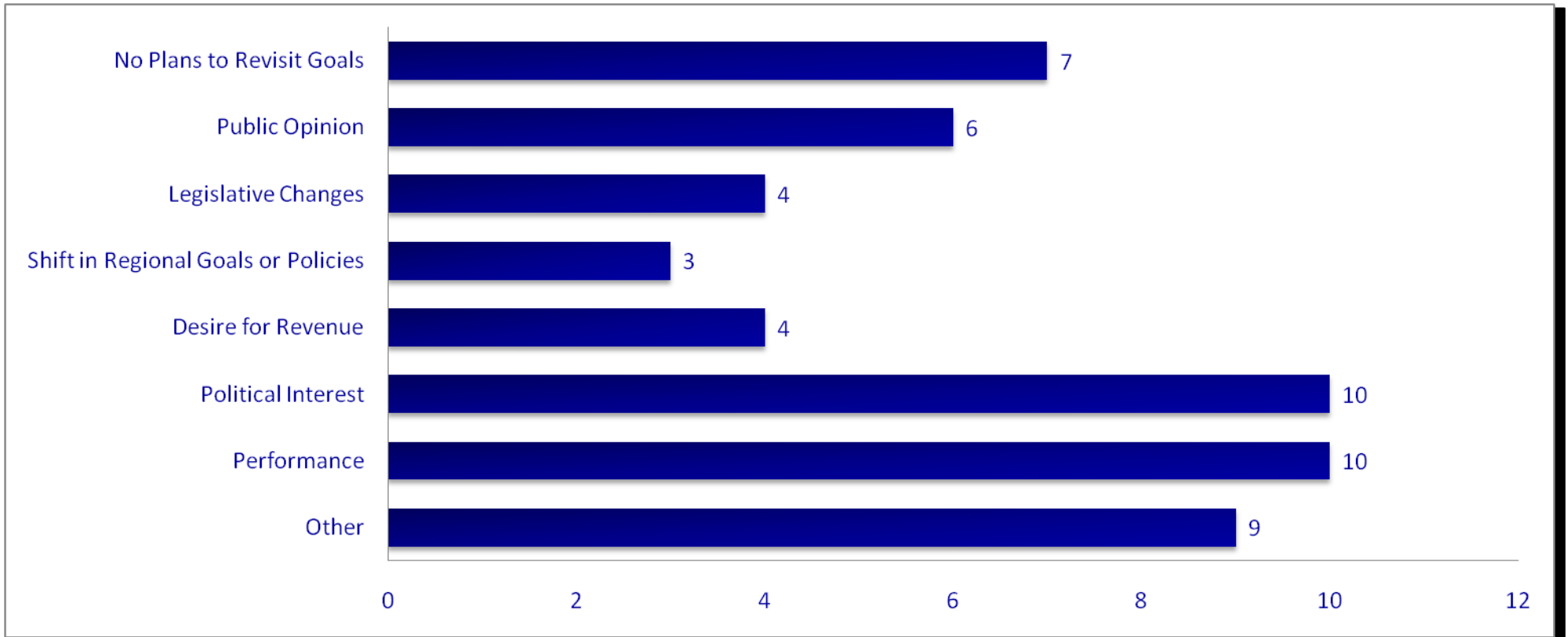
- ▶ 82% of respondents are monitoring system performance.
- ▶ In most cases, the operating agency is responsible for monitoring. Other monitoring entities include University / Research Centers and third party contractors
- ▶ Common Performance Criteria



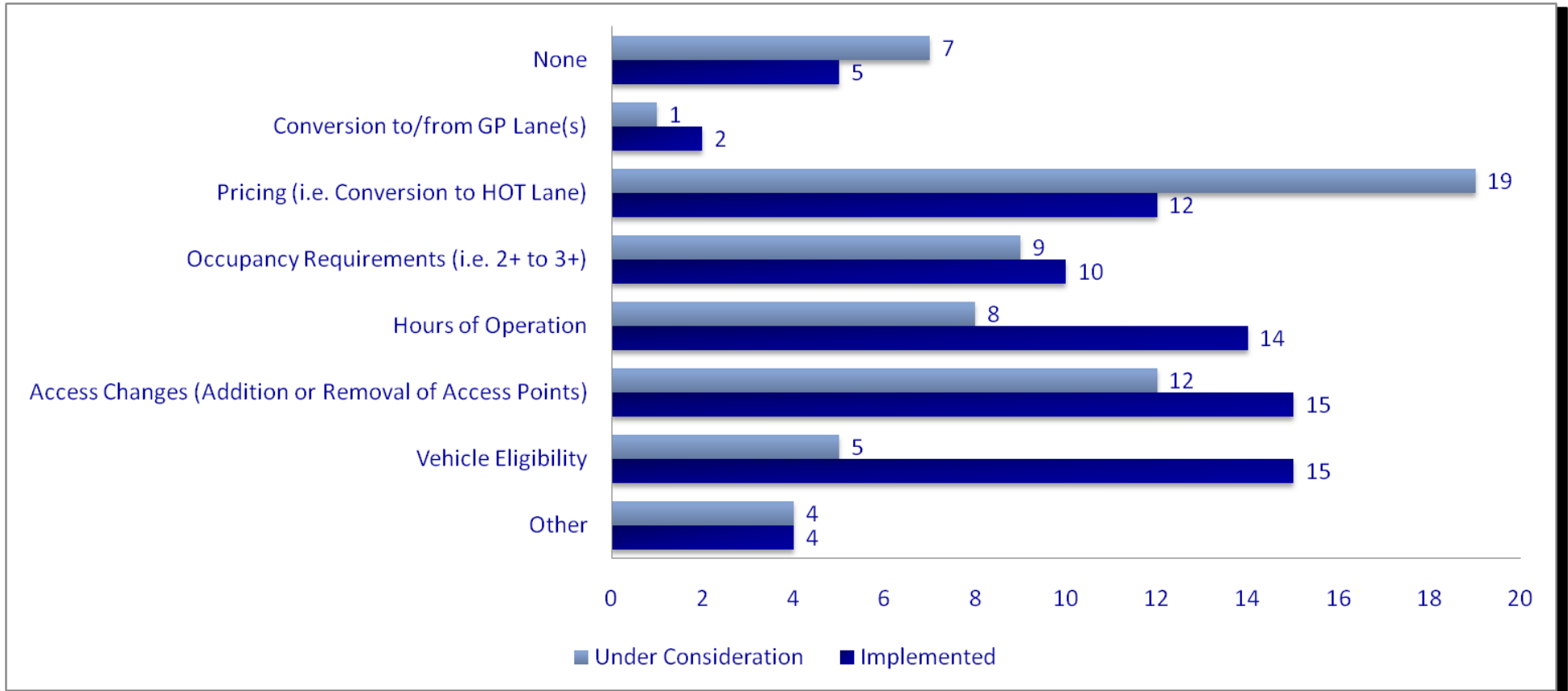
Are the lanes meeting your current performance objectives?

- ▶ **75% say “Yes”**
- ▶ **25% say “No” – concerns include:**
 - Congested lanes / demand / overcrowding issues
 - Speed issues – too slow to induce carpool formation
 - “End of line” issues
 - Lack of a continuous system
 - Violation / enforcement issues
 - Usage low during enforcement periods

Do you have plans to revisit / have you revisited system goals for any of the following reasons?



Have you applied any of the following policy changes to your original system? Are you considering changes in the future?



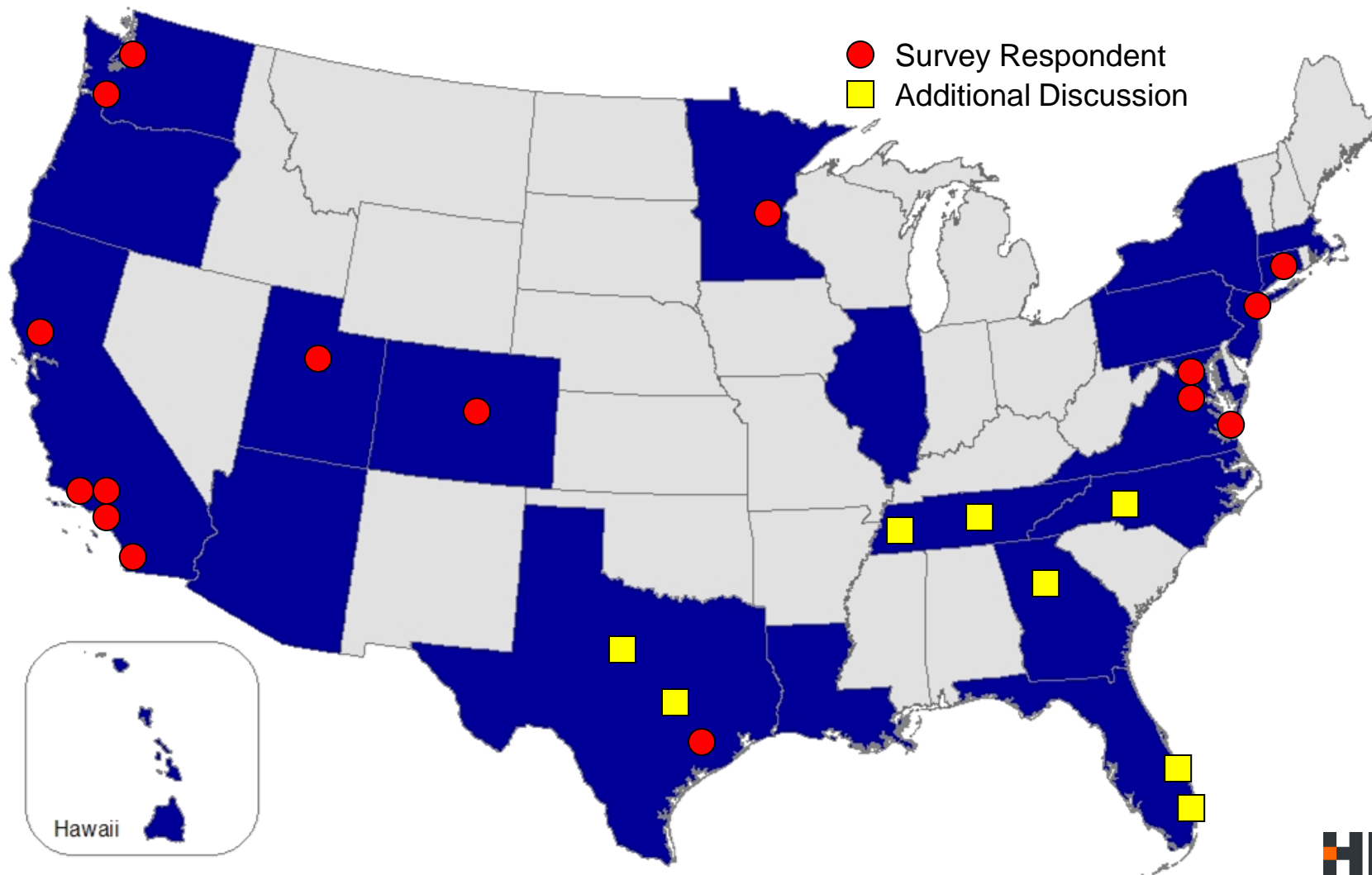
Survey conclusions

- ▶ **Most respondents are exploring some type of policy change, most frequently, pricing**
- ▶ **Respondents indicate that policy changes are most frequently influenced by performance, political interest, and public opinion**
- ▶ **Pricing is frequently viewed as a better performance option than changes to occupancy requirements due to impacts on the general purpose lanes**
- ▶ **Hybrid vehicles are most frequently considered in eligibility policy changes**
- ▶ **State legislation drives some types of policy changes, while other changes can be made easily in response to changing commute patterns and congestion**

Follow up with HOV owners

- ▶ **Collected data available from survey respondents and other sources**
- ▶ **Contacted specific representatives identified through relationships and HOV professional networks**
- ▶ **Discussions with contacts at the HOV Conference and HOT Workshop**
- ▶ **Expanded focus to include managed lane operators who did not convert from HOV**

Follow up with HOV owners



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Other issues identified in discussions as impacting policy changes:

- ▶ **Enforcement rate / issues**
- ▶ **Design issues / geometric constraints**
- ▶ **Future revenue**
- ▶ **Hybrid vehicles**
- ▶ **Legislative challenges**

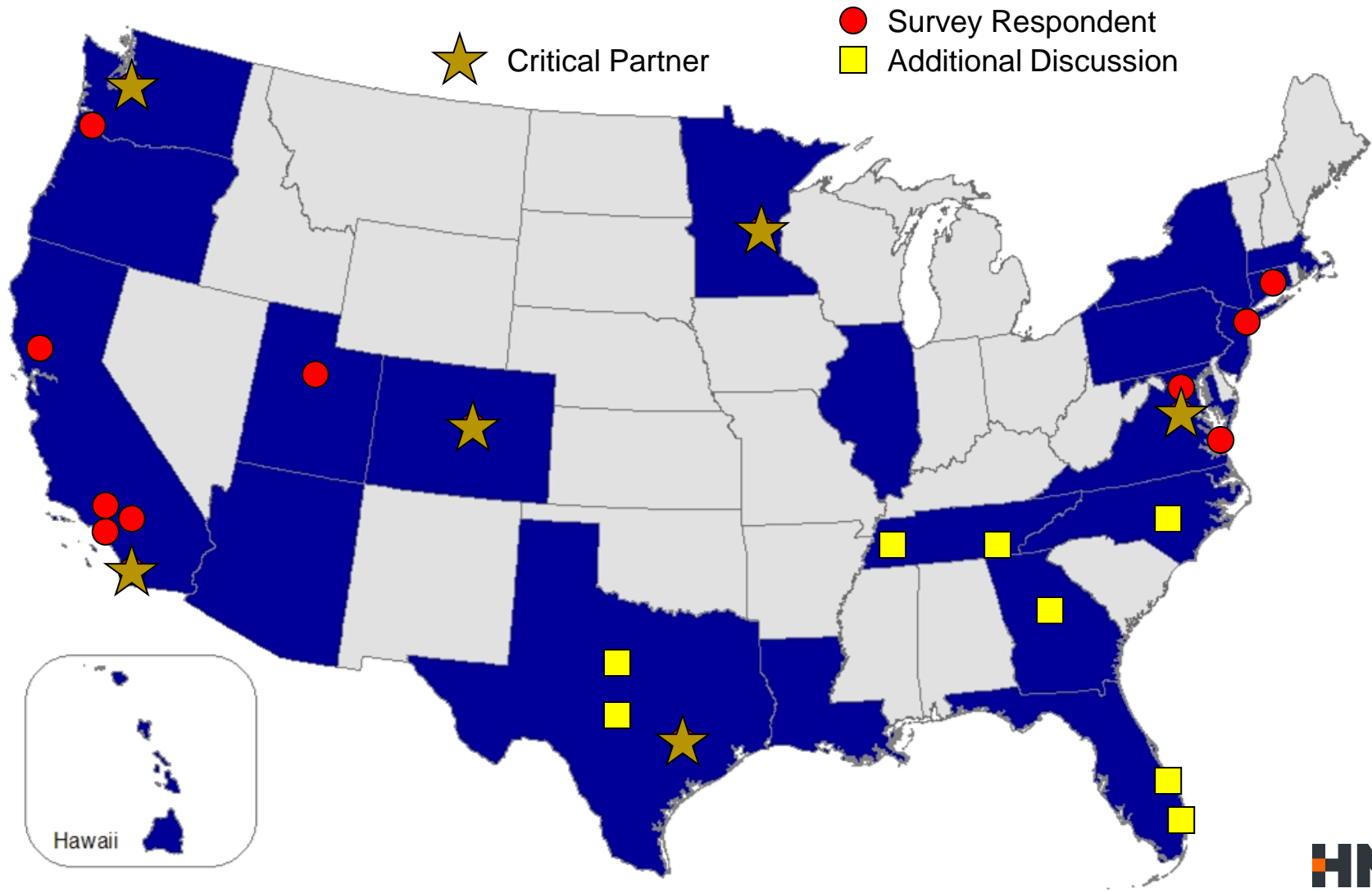
Identification and discussion with critical partners

▶ Identification of Critical Partners based on:

- Willingness to participate and share lessons learned
- Policy changes implemented or underway
- Transferability of operational characteristics
- Participation in ongoing performance monitoring activities
- Other?

▶ Discussion regarding key performance characteristics and issues

Identification of critical partners



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Critical partner discussion topics

- ▶ **Performance impacts of policy changes**
 - Before / After Data
- ▶ **Do you consider past policy changes to your system successful?**
- ▶ **What are your lessons learned related to policy changes?**
- ▶ **Are you considering pricing as a policy change? Why/why not?**
- ▶ **What do you see as the biggest hurdles to implementing pricing?**
- ▶ **Other?**

Purposes of the sketch planning tool

- ▶ Evaluate the current operating conditions of an existing HOV facility
- ▶ Quantify effects of policy tradeoffs
- ▶ Show effects of mixing and matching various policies to meet goals and objectives

The sketch planning tool has been structured to help hov operators answer the following questions:

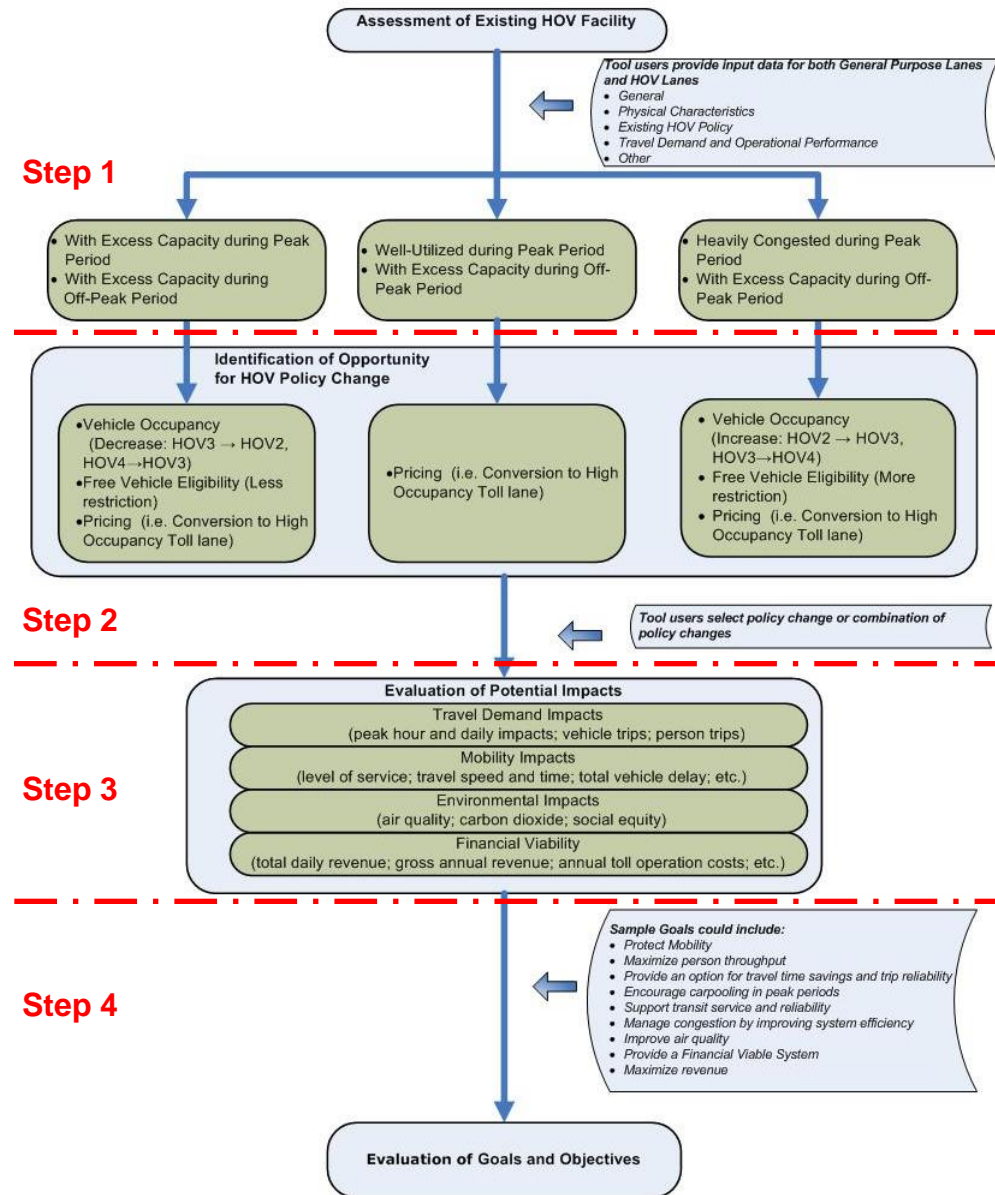
- ▶ **Effectiveness of HOV facilities**
- ▶ **Necessary and/or optional policy changes for excess capacity condition**
- ▶ **Necessary and/or optional policy changes for congested peak hour condition**
- ▶ **Potential impacts**
- ▶ **Will the policy change meet the goals and performance objectives?**

Framework and Key Steps

► Framework

► Key Steps

- Step 1:
Preliminary operational assessment
- Step 2:
Identification of opportunity for HOV policy changes
- Step 3:
Evaluation of potential impacts
- Step 4:
Evaluation of goals and objectives



Preliminary operational assessment of an existing HOV facility

▶ Based on user input data and established performance thresholds

▶ User input data

- Will be linked to FHWA Highway HOV Facility Inventory;
- General information of the facility;
- Physical characteristics;
- Existing HOV policies;
- Travel demand (peak hour and daily); and
- Others (Enforcement/Violations; Incidents).

▶ Performance thresholds

- Volume-to-capacity ratio
- Service flow rate (pc/l/hr)
- Travel speed (mph)

Federal Highway Administration
Policy Options Evaluation Tool for Managed Lanes (POET-ML)

Model Input Page

On this page, the user can select a specific HOV facility from a national database that includes information on policy details and physical characteristics. The user is then required to enter the number of HOV lanes and GP lanes in each direction during peak period operations as well as the corresponding volumes in these lanes. Optional user entry includes the volumes of other applicable vehicle types. Once valid values are entered for these items, the user can continue with the analysis. It is also possible to store a specific profile for future use by modifying the text for one or more of the input data field records.

Input Data Field	
State / Province	Georgia
City / County	
Urban Area	
Road	
Segment (From - To)	

General Information	
State / Province	Georgia
City / County	Fulton/DeKalb/Gwinnett
Urban Area	Atlanta
Road	I-85
Segment (From - To)	I-75 interchange to SR 316

Physical Characteristics	
Route Miles	23.9
No of HOV Lanes Per Direction	1
No of General Lanes Per Direction	4
Type	Concurrent (median)
Intermediate Access Separation	Yes Buffer

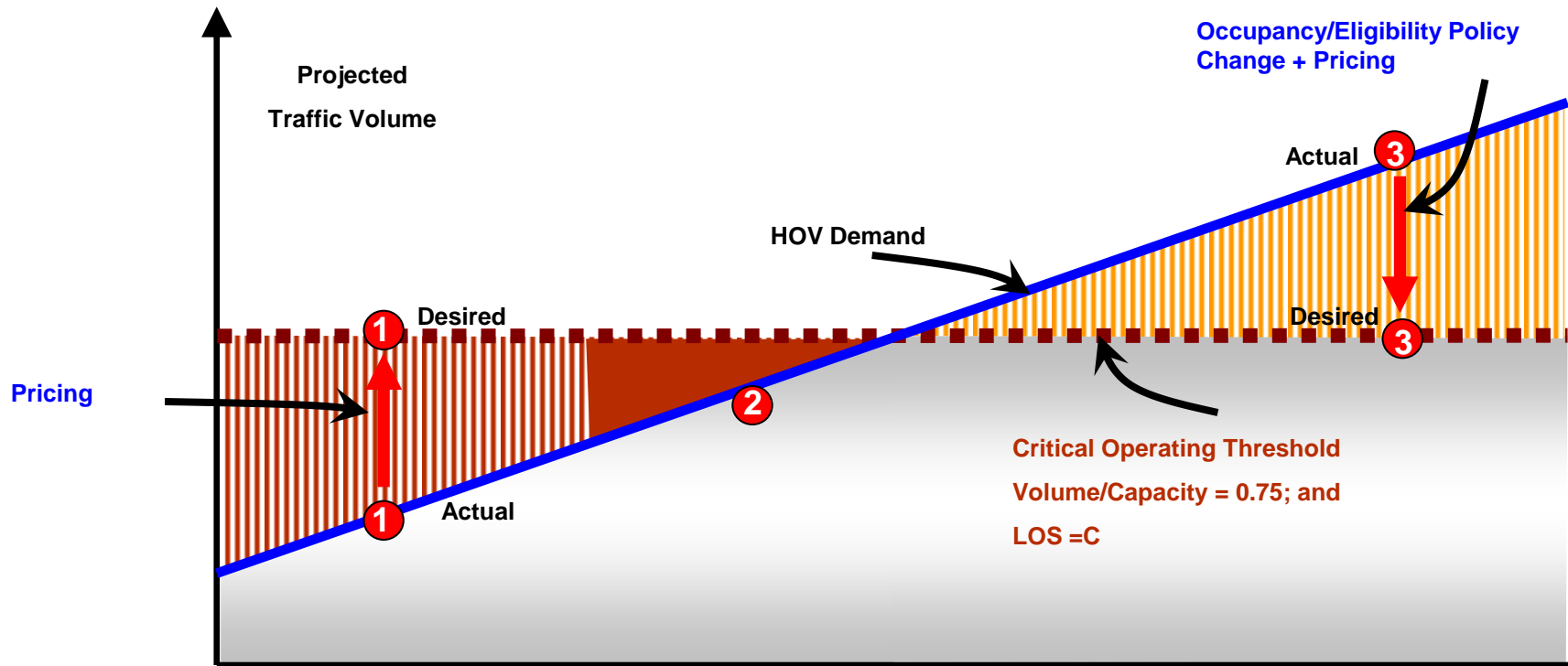
HOV Policy	
Eligibility HOV	2+
Eligibility Toll	No
Eligibility Motorcycle	Yes
Eligibility Taxi	No
Eligibility Special Fuel	Yes
Eligibility Others	Emergency & transit
Hours of Operation	24/7

Travel Demand and Operational Performance	
Total HOV Lane Volume (Peak Hour) in Peak Direction	2,000
Total GP Lane Volume (Peak Hour) in Peak Direction	8,000
Public transportation vehicles (no. of buses per hour) in HOV Lane	10
Percentage Motorcycles in HOV Lane	0%
Percentage Taxi in HOV Lane	1%
Percentage Low emission and/or energy efficient vehicles in HOV Lane	2%

Preliminary operational assessment of an existing HOV facility ... (continued)

▶ Three categories grouped by utilization of the facility:

- With Excess Capacity during Peak Period
 - With Excess Capacity during Off-Peak Period1
- Well-Utilized during Peak Period
 - With Excess Capacity during Off-Peak Period2
- Heavily Congested during Peak Period
 - With Excess Capacity during Off-Peak Period3



Identification of opportunity for HOV policy changes (required and/or optional)

- ▶ **Provide HOV owners with full range of possible policy changes**
- ▶ **Policy changes are based on the operational assessment results**
- ▶ **Focus on three major elements:**
 - Vehicle occupancy;
 - Free vehicle eligibility; and
 - Pricing.
- ▶ **Two sets of Policy Changes**
 - Potential policy changes for excess capacity condition
 - Potential policy changes for congested peak hour condition

Identification of opportunity for HOV policy changes (required and/or optional) ... (continued)

► Potential Policy Changes for Excess Capacity Condition

Operating Element	Direction of Change	Details	Policy Change Options
Vehicle Occupancy	Decrease	By downgrading the vehicle occupancy policy, the vehicles that don't meet passenger occupancy requirements could gain access to HOV lanes to capture the unused capacity in currently underutilized HOV lanes.	<input type="checkbox"/> HOV3 to HOV2
			<input type="checkbox"/> HOV4 to HOV2
			<input type="checkbox"/> HOV4 to HOV3
Free Vehicle Eligibility	Less Restriction	By allowing the vehicles that don't meet existing vehicle eligibility policy, such as low emission and energy-efficient vehicles to use the HOV lane, it captures the unused capacity and increases the utilization of the HOV lanes.	<input type="checkbox"/> Allow public transportation vehicles
			<input type="checkbox"/> Allow enforcement and emergency vehicles
			<input type="checkbox"/> Allow motorcycles
			<input type="checkbox"/> Allow low emission and energy-efficient vehicles
Pricing	Yes	<p>For the existing HOV lanes that are underutilized, allowing vehicles that don't meet passenger occupancy requirements to gain access to HOV lanes by paying a toll provide the opportunity to capture the unused capacity and expand mobility option.</p> <p>By pricing those ineligible vehicles, it also generates new revenue that if authorized can be utilized for multipurpose transportation improvements.</p>	<input type="checkbox"/> Allow Paying Vehicles - Maximize Revenue
			<input type="checkbox"/> Allow Paying Vehicles - Maximize Throughput



Identification of opportunity for HOV policy changes (required and/or optional) ... (continued)

► Potential Policy Changes for Congested Peak Period Condition

Operating Element	Direction of Change	Details	Policy Change Options
Vehicle Occupancy	Increase	By upgrading the vehicle occupancy policy, some existing HOV vehicles are eliminated from the lane providing additional capacity in currently overutilized HOV lanes.	<input type="checkbox"/> HOV2 to HOV3
			<input type="checkbox"/> HOV2 to HOV4
			<input type="checkbox"/> HOV3 to HOV4
Free Vehicle Eligibility	More Restriction	By disallowing some existing eligible vehicles from the lane, it provides additional capacity in currently overutilized HOV lanes.	<input type="checkbox"/> Disallow public transportation vehicles
			<input type="checkbox"/> Disallow enforcement and emergency vehicles
			<input type="checkbox"/> Disallow motorcycles
			<input type="checkbox"/> Disallow low emission and energy-efficient vehicles
Pricing	Yes	<p>Pricing needs to be bundled with the vehicle occupancy change and/or (free) vehicle eligibility change for the facility that is overutilized.</p> <p>By allowing paying vehicles to use the HOV lanes, it generates new revenue that if authorized can be utilized for multipurpose transportation improvements.</p>	<input type="checkbox"/> Allow Paying Vehicles - Maximize Revenue
			<input type="checkbox"/> Allow Paying Vehicles - Maximize Throughput

Evaluation of Potential Impacts

- ▶ **Assess the effects of the selected HOV lane policy change or combination of policy changes**

- ▶ **Track the following four basic measures of effectiveness:**
 - Travel demand impacts
(peak hour and daily impacts; vehicle trips; person trips)
 - Mobility impacts
(peak hour and daily impacts; level of service; travel speed and time; total vehicle delay; etc.)
 - Environmental impacts
(air quality; carbon dioxide; social equity)
 - Financial feasibility
(total daily revenue; gross annual revenue; annual toll operation costs; mobility benefits; etc.)

Evaluation of Potential Impacts – Key Methodology and Assumptions ... (continued)

▶ Assumptions

- Highway capacity
- Mobility
- Environmental impacts
- Financial feasibility

▶ Established through literature reviews

▶ Consistent with FHWA's SMITE-ML tool assumptions

▶ Calibrated using survey result data

▶ Interactive and transparent to the user

▶ Can be adjusted to reflect unique characteristics of facilities and region

Federal Highway Administration
Policy Options Evaluation Tool for Managed Lanes (POET-ML)

BACK

Sketch Planning Tool Parameters

HOME PRINT

RESET PARAMETERS

Baseline assumptions for these parameters are subject to change based on local knowledge. All values in blue can be modified. Original values can be restored by clicking the "Reset Parameters" button.

Highway Capacity Assumption

	Managed Lanes	GP Lanes
Free-Flow Speed (mph)	65	65
Daily Freeway Capacity Per Lane (vph)	2,200	2,200
Daily Freeway Capacity Per Lane (vph)	35,000	35,000
% of capacity used at LOS C (free-flow)	0.75	0.75
Peak Hour to Daily Conversion Factor	12	12
Light Auto Occupancy	n/a	1.10
Heavy PCE Factor	3.00	n/a
Light Occupancy	20	n/a
OV Split		
OV2	85%	2.20
OV3	10%	3.30
OV4+	5%	4.40

Mobility Assumption

	A	B	C	D	E
PR Curve - Alpha	0.30				
PR Curve - Beta	3.00				
Level of Service	A	B	C	D	E
Maximum V/C	0.30	0.50	0.75	0.90	1.00
Maximum Service Flow Rate (pc/H/Ln) - HOV	660	1100	1650	1980	2200
Maximum Service Flow Rate (pc/H/Ln) - GP	660	1100	1650	1980	2200
Minimum Speed (mph) - HOV	63	58	47	39	34
Minimum Speed (mph) - GP	63	58	47	39	34
Volume Contribution to HOT Lanes (From GP)	30%	40%	50%	60%	70%
Volume Contribution to HOT Lanes (From Parallel Facilities)	70%	60%	50%	40%	30%

Environmental Impacts Assumption

	Passenger Car Average Emissions
Air Quality - Pollutant	
CO (kg/gallon)	14.44
CO ₂ (kg/gallon)	1.27
HC (kg/gallon)	1.31
Carbon Dioxide (kg/gallon)	0.73
Gallons of Fuel Per Hour (gallon/hr)	0.68

Financial Feasibility Assumption

Minimum value of time	125
Number of Working Days per Year	250
Weekend Revenue/Weekday Revenue Ratio	25%
Annual Toll Operation Costs per Transaction	10.15
Weekend Operating Cost/Weekday Operating Cost Ratio	25%

Evaluation of Goals and Objectives

- ▶ **Evaluate the effects of mixing and matching various policies to meet goals**
- ▶ **Produce the evaluation matrix**
- ▶ **Sample goals include the following:**
 - Protect and improve mobility
 - Improve roadway operation efficiency and reliability
 - Provide an option for travel time savings and trip reliability
 - Maximize person throughput
 - Promote transit and ridesharing and encourage carpooling in peak periods
 - Support transit service and reliability
 - Manage congestion by improving system efficiency
 - Maintain safety
 - Improve air quality
 - Provide a financially viable system
 - Maximize revenue

Questions?

▶ Contact Information

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