

# THE IMPACT OF U.S. HOV AND HOT LANES ON CONGESTION

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# Overview



- Part 1: The evolution of HOV and HOT lanes in the United States
- Part 2: HOT lane performance
- Part 3: HOT lanes' implications for freeway pricing

# Part I: Evolution

## From busways to HOV lanes

- Busway rationale was reducing oil imports.
- Excess capacity on bus lanes led to allowing vanpools and 4-person carpools.
- Excess capacity then led to HOV-3, and ultimately HOV-2.
- Rationale became reduced emissions.
- New federal policy: only lane additions allowed were HOV, not GP.

## Second thoughts on HOV lanes

- Most HOV lanes either too full or too empty.
- HOV lane “revolts” urged conversion to GP lanes.
- Fam-pooling recognized as a problem.
- No workable way to verify occupancy or enforce it.
- Long-term decline in carpooling as more lanes added (from 19.7% of commuters in 1980 to 9% in 2018).

## Origin of HOT lanes

1991 federal law changes:

- Allowing addition of toll lanes to federal-aid highways.
- Creation of FHWA Congestion Pricing Pilot Program.

Independent of these, California law allowed:

- SR 91 (Orange County) to add privately financed variable toll lanes.
- I-15 (San Diego) to convert HOV-2 lanes to HOT-2.

## Growth of HOT lanes

- Federal program renamed *Value Pricing Pilot Program*.
- Early projects converted HOV-2 to HOT-2
- Next privately financed lane additions: HOT-3 on Beltway outside Washington, DC
- Both kinds proliferated since mid-2000s.
- TRB created Managed Lanes Committee and projects database.
- 53 ML projects in operation by mid-2020

## Changing HOT lanes trends

- HOT networks added to metro-area long-range transportation plans.
  - Newer projects increased requirement for HOT-3 or gave no exemptions to carpools.
  - Increasing fraction developed as lane additions, financed by toll revenue bonds:
    - Some carried out under long-term P3 agreements
    - Others carried out by state or local transportation agencies
- Most of these have investment-grade bond ratings.

# Part 2: HOT lanes performance



## Findings on customers

- Increased understanding of values of time and values of reliability (Small, et al.)
- Newest concept: value of urgency (Bento, et al.)
- Demographic and vehicle data counter the idea of “Lexus Lanes”
- Most motorists use HOT lanes only occasionally, for specific trips of high value (informal 90/10 rule)



## Impact on transit use

- Less-congested corridor as preferred guideway for express bus service.
- Transit agencies increasingly taking advantage of HOT lanes.
- Some data show significant increases in bus ridership, compared with bus in HOV lane.
- Nearly all planned HOT lanes plan to host express bus service.

## Impact on carpooling

- I-15 had carpool increase after HOV to HOT conversion.
- HOT-2 often led to carpool increase.
- HOT-3 usually leads to carpool decrease, at least in the lanes themselves.
- Atlanta (I-85) and Miami (I-95) permit registered carpools only, to exclude fam-pools.

## Equity findings, (I)

### Detailed I-405 study (Hallenbeck, et al.)

- Regular users (8% of total) account for 76.5% of daily use.
- Lowest-income users are 20% of AM peak, 12% of PM peak.
- Net benefit findings (VOT saving minus toll cost)
  - \$2.50/trip for lowest-income group
  - \$1.70/trip for middle-income group
  - \$1.45/trip for high-income group.

## Equity findings (2)

Social welfare modeling, DFW area, (Do, et al)

Four alternative freeway projects:

- Add GP lane
- Add HOV lane
- Add HOT lane (“priced ML”)
- Price all lanes.

“Priced ML” showed the greatest increase in social welfare.

## HOV/HOT enforcement

- Original method (still used) is highway patrol officers' eyeballs.
- Various roadside camera systems (none is accurate or reliable enough)
- Switchable transponder (honor system)
- Smartphone is newest approach.
- Registered carpool with regular certification

# Part 3:

## HOT lanes and freeway pricing



- The congestion reduction and equity benefits of HOT lanes offer some degree of hope for eventual freeway pricing.
- However, the political difficulties must be thought through and overcome, for this to happen

## Political difficulties

### World Bank analyst's three groups (Hau):

- The tolled—winners
- The tolled-off—losers
- The un-tolled—losers

### Dealing with the losers:

- Compensate them using toll revenue (Small, King)--  
or
- Create a value-based approach

## Change the rhetoric from negative to positive

Support for HOT lanes increased when focus shifted:

*Congestion Pricing* Pilot Program suggested forcing people to pay for driving during peaks (punitive).

*Value Pricing* Pilot Program offered valued time savings for those who choose to pay (opportunity).

How can we apply this lesson to freeways?



# A proposed evolution toward freeway pricing



- Emerging HOT networks will increase familiarity with motorist and transit benefits of variable pricing.
- As fuel tax revenue continues to decline, stress the need to replace it with per-mile charges, starting with limited-access highways/freeways
- Urge modest peak/off-peak charge for regular (GP) lanes with continued variable (market) pricing in premium (HOT) lanes.
- The rationale here is to extend the value pricing *benefits* to regular lanes, to ensure they are properly funded and work better long-term.
- This approach would avoid rhetoric about shifting motorists out of freeways (punitive) and seek to attract them to pricing's proven benefits.