

# Benefit/Cost Analysis of Value Pricing Projects

Presented to the Pooled Fund Committee

April 26, 2011

Jack Faucett Associates

SAIC

ECONorthwest



## The Cost of Congestion

- \$87.2 billion in 2007 from wasted fuel and lost productivity
  - (More than \$750 for every U.S. traveler)
- 2.8 billion gallons in wasted fuel
  - (Three weeks' worth of gas per traveler)
- 4.2 billion hours in wasted time
  - (Nearly one full work week per traveler)

# Value Pricing

- What is Value Pricing?
- Value Pricing and Managed Lanes
- Goals
  - Reduce congestion
  - Improve travel times
  - Encourage transit use
  - Reduce vehicle emissions
  - Reduce energy consumption
  - Fund transportation programs and projects
  - Promote regional economic development

4/26/2011

3

# Study Objective

- FHWA wants to help operating agencies implement **Variable Pricing** in managed lanes
- How does Variable Pricing work?
- Three options under consideration
  1. Construct new, variably-tolled Express Lanes
  2. Convert existing HOV lanes to variably-tolled Express Lanes
  3. Convert all lanes of a conventionally-priced toll road to variable pricing

4/26/2011

4

## Study Objective

- Goals of this project:
  - Identify and analyze societal benefits and costs associated with value pricing projects
  - Provide a tool to help policy makers quickly determine the benefits and costs of different variable pricing options
  - Help transportation planners and engineers evaluate the benefits and costs of current and future value pricing projects
  - Assist with the outreach and awareness of value pricing

4/26/2011

5

## How Will We Accomplish This Objective?

- Our Approach
  - Collect as much data from as many managed lane facilities as possible
    - There are currently only around 10 active managed lane facilities in the U.S.
    - Many facilities have poorly maintained data on volume and toll activity
  - Supplement actual facility data with model data
    - ECONorthwest offers two models to help address the data paucity problem

4/26/2011

6

# ECONorthwest Models

- Toll Optimization Model
  - Equilibrium lane volumes
  - Toll levels
  - Revenues
  - Associated travel times for tolled highway facilities
- Benefit-Cost Model
  - Costs over Project Lifecycle
    - Design and engineering
    - Land acquisition in the case of facility expansion
    - Construction/capital equipment for collecting tolls
    - Reconstruction
    - Rehabilitation/maintenance of road and tolling infrastructure
    - Enforcement of tolling facility
  - Benefits from Facility Operation
    - Travel time saving
    - Improved reliability
    - Reduced vehicle operating cost
    - Freight inventory cost reductions
    - Emission reduction for major pollutants and fuel savings
    - Revenue Transfers
    - Effects of Traffic Inducement
    - Safety

4/26/2011

7

## What is the Final Product?

- A “Reduced Form Model” that has the relationships that have been revealed through this analysis
- The Spreadsheet Tool
  - Excel-based interface
  - User-controlled
  - Flexible inputs
    - Question and answer method (like TurboTax)
    - Scenario method (multiple simultaneous inputs in a template)
  - More consistent, comprehensive, and reliable than if existing data alone were relied on
  - Test a wide range of scenarios quickly and easily
  - No special expertise in road pricing theory required
  - Easy-to-read supporting documentation
- Create flexible framework so a policy maker, planner, or engineer can determine the benefits and costs of several variable tolling options

4/26/2011

8

## What is Benefit/Cost Analysis?

- A Benefit/Cost Analysis (BCA) quantifies the benefits and costs of a particular project structure to determine whether an investment is justifiable
- BCA must express all benefits and costs in monetary terms
- The benefit/cost ratio is the net present value of benefits divided by the net present value of costs
  - A benefit/cost ratio of more than one indicates that benefits exceed costs and that the investment is promising
  - A ratio less than one indicates that benefits are less than costs and that further study or innovative strategies should be used to justify the project

4/26/2011

9

## Accomplishments To-Date

- Reviewed other ongoing FHWA studies that include data and BCA for managed lanes
- Identified candidate facilities for data collection effort
  - TX I-10 (Katy Freeway)
  - TX US-290
  - CO I-25
  - FL I-95
  - MN I-35W
  - CA SR-91
  - MN I-394
  - CA I-15
  - WA Highway 167
  - UT I-15 near Salt Lake City
  - CA I-680 near San Francisco

4/26/2011

10

## More Accomplishments To-Date

- Data Dictionary
  - ECONorthwest has completed the inventory of all data elements needed for their models
  - This dictionary is guiding the data collection effort
  - Data elements include:
    - General facility information, such as corridor ID and type of pricing
    - Specific facility data, such as HOT and regular lane capacity, free flow speed, and length
    - User data, such as vehicles per hour, mean value of time, and passenger car equivalent per vehicle
    - Toll data, including maximum and minimum constraints and toll per vehicle class

4/26/2011

11

## The Ongoing Data Collection Effort

- Challenges
  - Poorly maintained data on volume and toll activity
  - Projects differ on many dimensions
    - Corridor Volumes
    - Demographic Conditions
    - Carpool Policies
    - Traffic Composition
    - Tolling Objectives
    - Facility Geometry
    - Pricing Methodology and Limits
    - Hours of Operation
  - Limited available data on site, but facilities may provide Existing Conditions Reports, which include additional facility data
  - Calls to regional DOT and facility operators are required
  - Fulfillment of our requests for data can take a long time

4/26/2011

12

## Pooled Resources?

- Other groups working for the Urban Partnership Program on similar studies also need this data
- These groups are also at the data collection phase, but many have not started
- Pool the data collection effort
- At a minimum, share data among UPP members

4/26/2011

13

- The next slides present an example of data issues encountered

4/26/2011

14

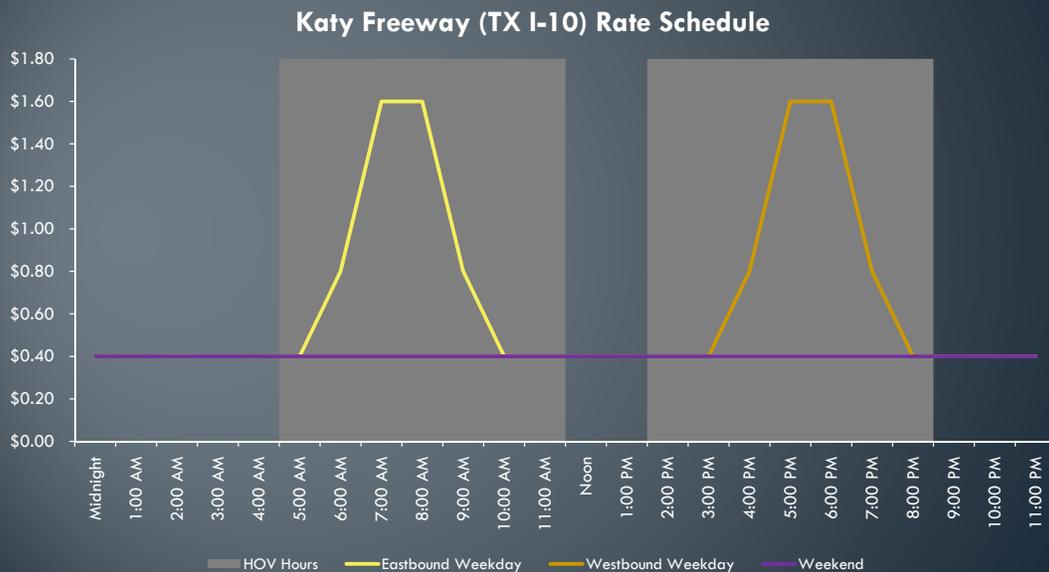
## Example of Data Issues

- Katy Freeway
- Katy Freeway (I-10) uses a rate schedule that varies by Time of Day and Weekday/Weekend.
- HOV hours (where HOV 2+ ride free) are from 5AM to 11AM and from 2PM to 8PM, weekdays
- Peak times (where the toll for SOV and trucks is increased) are within the HOV hours

4/26/2011

15

## Katy Freeway Rate Schedule



4/26/2011

16

## Katy Data Issues

- Katy's schedule presents the following groups of hourly data (example):
  - Eastbound-HOV hours-Off peak-afternoon
  - Eastbound-HOV hours-Off peak-morning
  - Eastbound-HOV hours-On peak-afternoon
  - Eastbound-HOV hours-On peak-morning
  - Eastbound-Non HOV hours-8PM-5AM
  - Eastbound-Non HOV hours-11AM-2PM
  - Westbound...(see above)
  - Weekend
- Each set has different rates, volumes, and speeds
- Each collection of data outlined above needs to be collected for each segment
- Katy Freeway has 5 managed lane segments, 13 general purpose lane segments

4/26/2011

17

## Another Example (It's complicated)

- SR-91
- SR-91 uses a static (periodically updated) rate schedule based on Time of Day and Day of Week
- Unlike Katy, SR-91 utilizes different rates for almost every hour of the day, for every day of the week
- For example, Friday at 2PM, Eastbound, the rate is \$3.10. At 3PM, the rate jumps to \$10.25
- There are even differences on weekend days:

Saturday		Sunday	
2:00 PM	\$3.00	2:00 PM	\$3.00
3:00 PM	\$3.00	3:00 PM	\$2.50

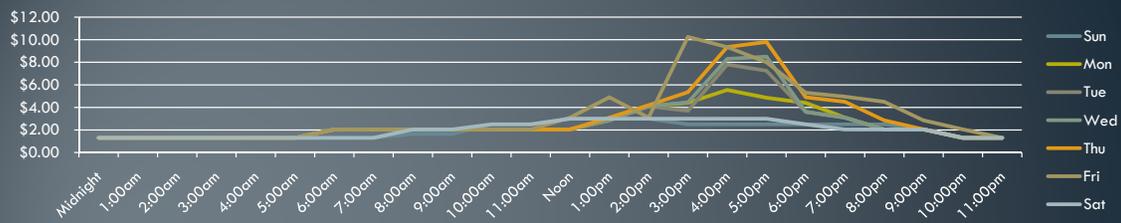
- 2 directions \* 24 hours \* 7 days of the week = 336 rows of data for SR-91 for which we need rates, volumes, and speeds
- Now add to this: CA I-15 can modify its rates every 6 minutes...

4/26/2011

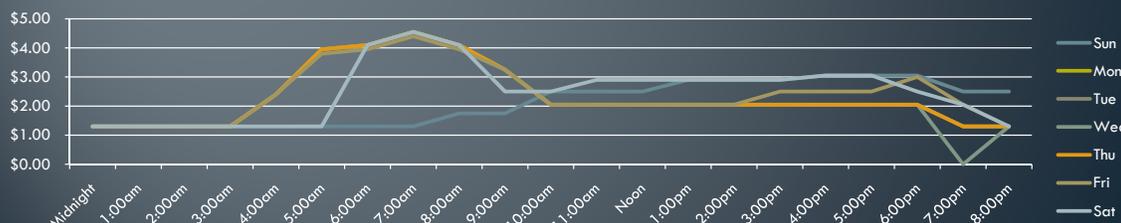
18

# SR-91 Rate Schedules

## SR-91 Rate Schedule, Eastbound



## SR-91 Rate Schedule, Westbound



4/26/2011

19

## Data Issues

- There are other issues that complicate the data collection effort
- Some facilities have different rules for individual segments. A 2+ segment may change into a 3+ and then back into a 2+
- Some facilities collect volume data per hour, while others collect per day, or only during congested periods
- Static-schedule facilities may use special holiday schedules, which affect the data for that day/week
- When facilities add additional managed lanes conditions and dynamics change, prior existing conditions reports are no longer valid

4/26/2011

20

# Outlook

- There have been some challenges in acquiring sufficient data from the managed lane facilities
- Projects managed by other teams that will also need data from managed lane facilities have yet to commence their data collection efforts
- However, with the models from ECONorthwest our Team requires only a few key pieces of information for each facility to be able to generate adequate supplemental data
- The Team would welcome suggestions for other sources of managed lane data, previous reports, or local facility contacts

4/26/2011

21

# The Team

- **SAIC**
  - Daniel Stock, Task Manager
- **Jack Faucett Associates**
  - Michael Lawrence, Principal Investigator
  - Jon Skolnik, Senior Economist
  - Devon Cartwright-Smith, Economist
- **ECONorthwest**
  - Randall Pozdena, Ph.D, Co-Principal Investigator
  - Carl Batten, Senior Economist
  - Steven Carter, Ph.D, Mid-Level Economist

4/26/2011

22

## Contact Information

**Michael F. Lawrence**

JFA President

4550 Montgomery Avenue

Suite 300N

Bethesda, MD 20814

Phone: (301) 961-8835

Fax: (301) 469-3001

lawrence@jfaucett.com