National Evaluation of a Mileage-based Road User Charge

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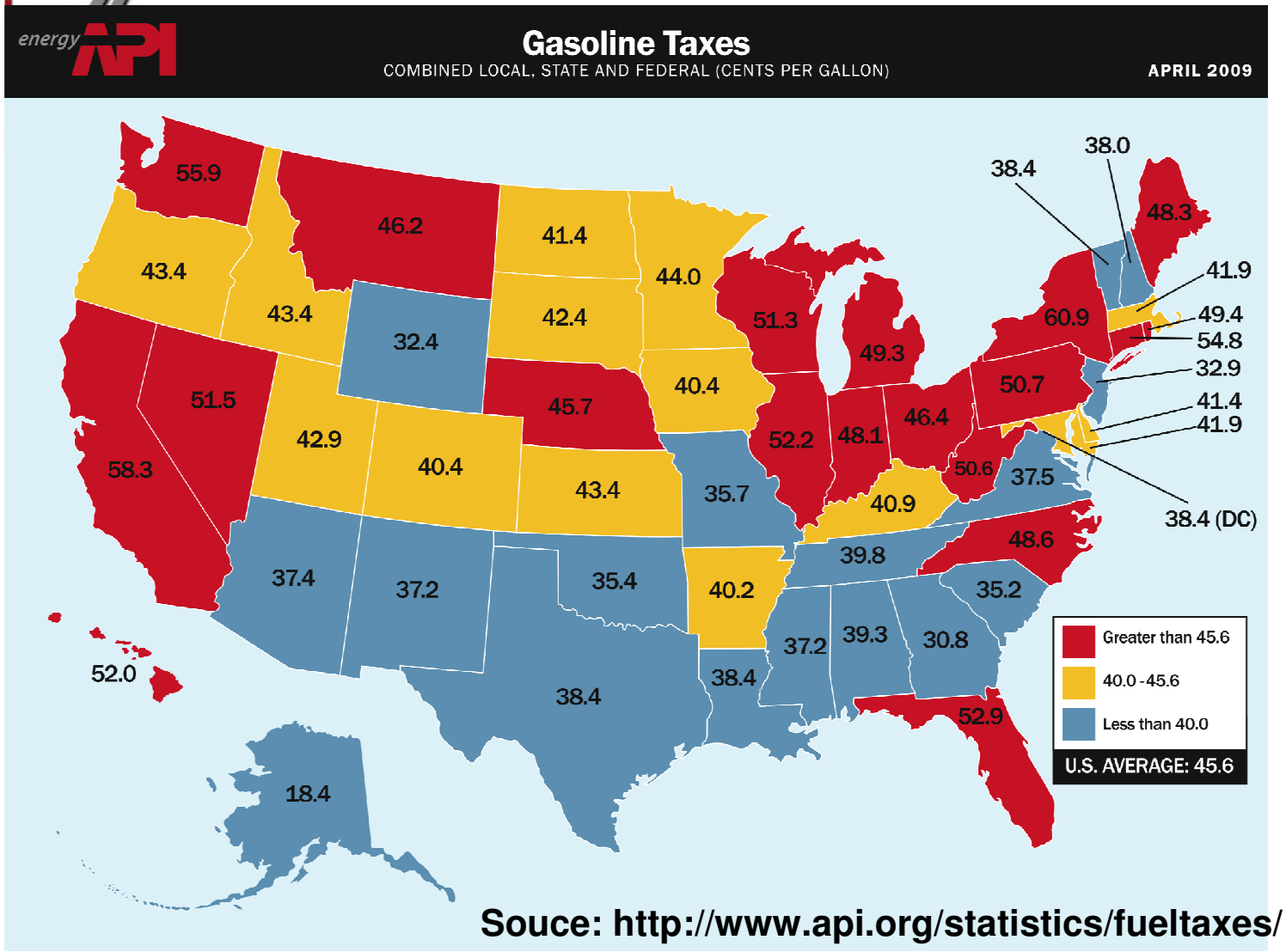
Current U.S. Highway Funding Mechanisms

- The motor fuel tax has served as the primary funding source for U.S. roads for over 70 years
  - Federal tax: Currently $0.184/gallon for gasoline and $0.244/gallon for diesel
    - Provides 90% of the revenue for the federal Highway Trust Fund
    - Federal Highway Trust Fund revenue from motor fuel tax: $35.2 billion in FY06
      - $25.5 billion from gasoline/gasohol
      - $9.7 billion from diesel

Current U.S. Highway Funding Mechanisms (Cont.)

- Motor fuel tax (continued):
  - State and local motor fuel tax
    - State motor fuel tax rates range from $0.00/gal to $0.40/gal
    - Some local jurisdictions (county, city) impose additional motor fuel taxes
    - Most state/local taxes are flat per-gallon fees. However some are a percentage of the fuel purchase price and others are a combination of fixed and percentage tax.

Mileage-based Road User Charging



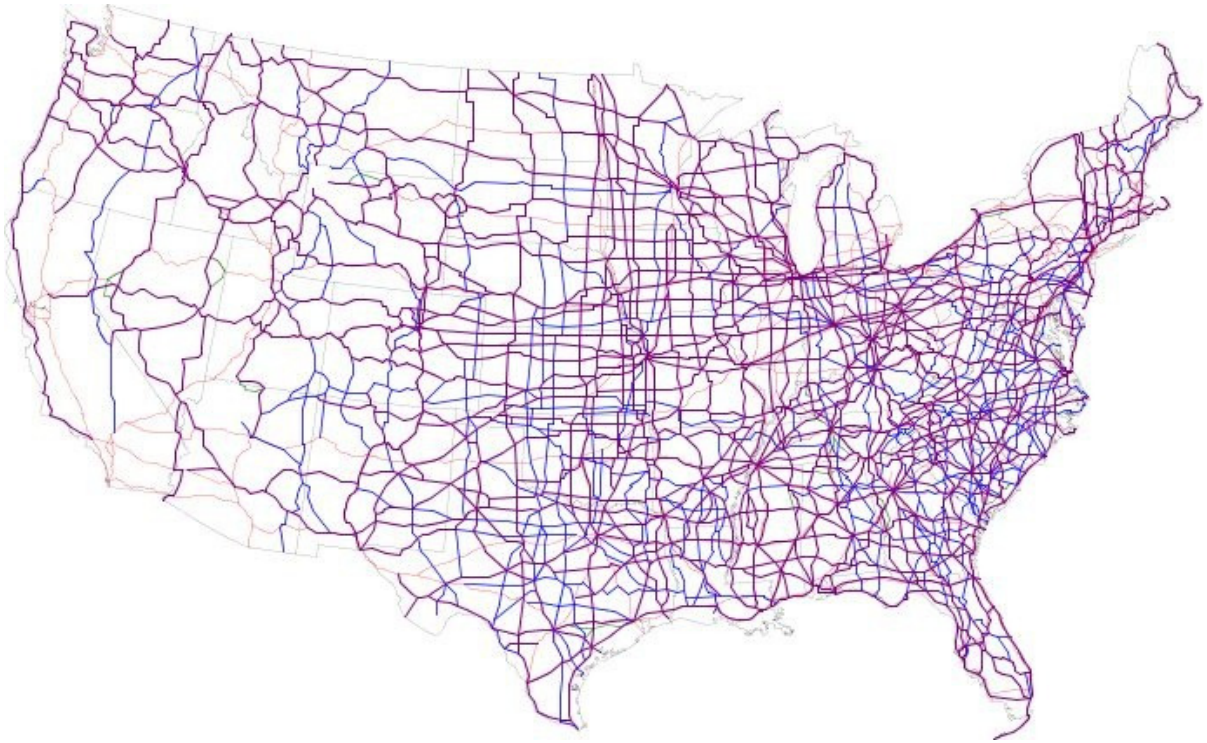
Souce: http://www.api.org/statistics/fueltaxes/

Current U.S. Highway Funding Mechanisms (Cont.)

- Some additional constraints:
  - There are approx. 250 million registered motor vehicles in the U.S.
  - The median vehicle age is over 9 years
  - Annual distance traveled in the U.S. by all motor vehicles exceeds 3 trillion miles
  - The average driver pays a little over $20 per month
  - Total annual revenues (federal, state, local) are in the neighborhood of $80 billion.

Mileage-based Road User Charging

Mileage-based charging must work everywhere



There are 160,000+ miles of federal highways in the U.S., 46,000 miles of which are Interstates

Mileage-based Road User Charging

The Looming Highway Funding Crisis

- The Fuel Tax no longer generates sufficient revenue to fund highway infrastructure needs
- By FY2009 the Federal Highway Trust Fund will have a shortfall of $4 to $5 billion.
- If changes are not made, this shortfall is projected to reach more than $25 billion by 2012.
- Longer-term projections are even more dire
- Equally severe problems exist at state and local levels.
- Three recent federal studies have recommended switching to a mileage-based charging system

National Evaluation Study

- The National Evaluation of a Mileage-based Road User Charge is being conducted by the University of Iowa
  - Six test sites (year one): San Diego, CA; Boise, ID; Austin TX, Eastern Iowa; Baltimore, MD; Raleigh/Durham, NC
  - The study currently has 1200 participant vehicles
  - An additional 1500 participants will be selected in summer/fall 2009
- Study Goals
  - Preliminary feasibility assessment
  - Assess public attitude and acceptance of Mileage-based charging concept

Study Background

- Phase I: 1999-2003
  - Funded by the U.S. federal Highway Administration (FHWA) and a consortium of 15 state Departments of Transportation (Headed by Mn/DOT)
  - Studied wide range of issues related to the development and implementation of a mileage-based charge as an alternative to the current motor fuel tax.
  - Developed an initial architecture for a mileage-based road user charge system
- Phase II: 2005-2009
  - Funded in SAFTEA-LU of 2005
  - National evaluation study of a prototype road user charge system
  - Critical assessment of technological feasibility and public acceptance

Study Objectives

- Assess the feasibility and efficacy of replacing the current motor fuel tax with a mileage-based user charge
  - Technology
  - Robustness
  - Privacy and security
  - Transition/phase-in
  - Public policy ramifications
  - Public acceptance

Study Considerations

- Robustness
  - System would be responsible for collecting more than $80 billion per year in user charges
  - Must be accurate and reliable
  - Must function effectively in all environments
    - Atmospheric conditions
    - “Urban canyons”
    - Rural areas with limited wireless infrastructure

Study Considerations

- Security
  - Fraud and evasion efforts are inevitable
  - System would be an attractive target for various types of cyber-attacks.
  - Potential target for terrorism

Study Considerations

- Privacy and Public Acceptance
  - Privacy concerns This is the “hot-button” issue
  - Many people fear that government will use the system to track them
  - Public understanding of technologies such as GPS is limited.
  - There is a fundamental tension between protecting privacy and providing auditability.
  - may be the single largest obstacle to transitioning to a mileage-based road user charge.

Study Considerations

- Cost and Efficiency
  - Cost overhead for user fee collection must be low (no more than a few % of total revenues)
  - Must be able to accommodate users who function on a cash-only basis
  - Must be efficient mechanisms for enforcement of fee payment

Study Considerations

- Phase-in
  - If necessary equipment for mileage-based charging is only included in newly manufactured vehicles, a long phase-in period will be required
  - During this period, it may be necessary to operate a dual system--i.e. some pay the gas tax and some pay a mileage-based charge.

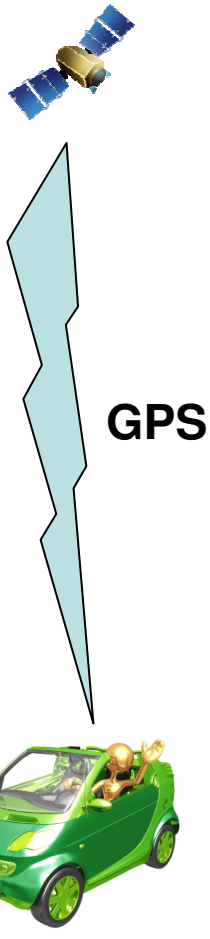
Study Considerations

- Charging Policy
  - A mileage-based road user charge system provides great flexibility for setting charge rates. Options include:
    - Neutrality vis-à-vis gas tax
    - Incentives for fuel efficiency/ “green” vehicles
    - Charge-rate based on overall “carbon footprint”

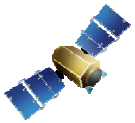
System Architecture

- An electronic unit is installed in each vehicle consisting of:
  - An on-board computer system
  - A Global Positioning System (GPS) receiver
  - A simple geographic information system identifying the boundaries of all road-use charge jurisdictions
  - An associated rate table containing current per-mile charge rates for each region
  - A cellular wireless transmitter-receiver

Mileage-based Road User Charging



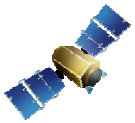
Mileage-based Road User Charging



Accrued Mileage Charge Data

Cellular data service

Mileage-based Road User Charging



Collection Center (Back Office)

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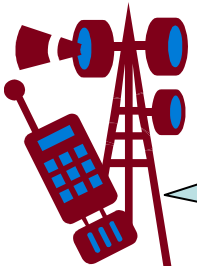
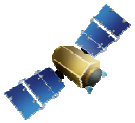


Secure Network

Mileage-based Road User Charging



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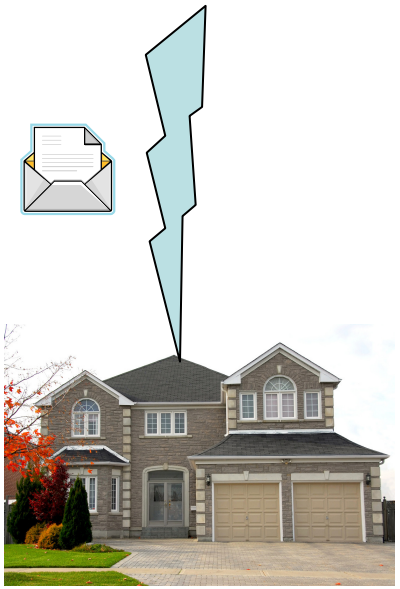
Bill for Total accrued charges



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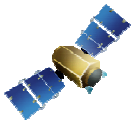

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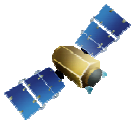
Payment for total accrued charges

Mileage-based Road User Charging



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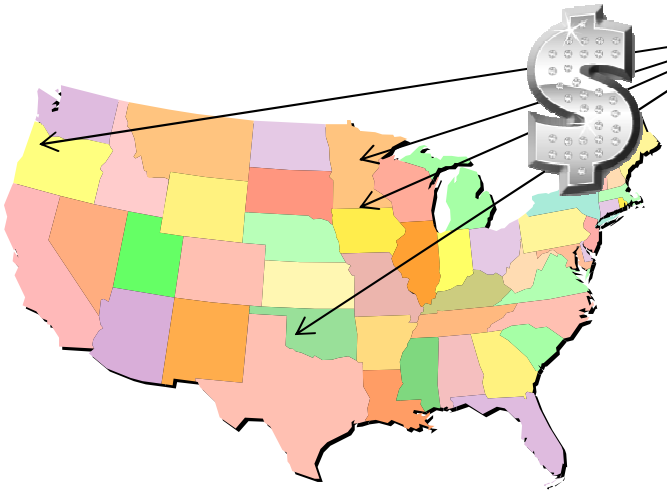
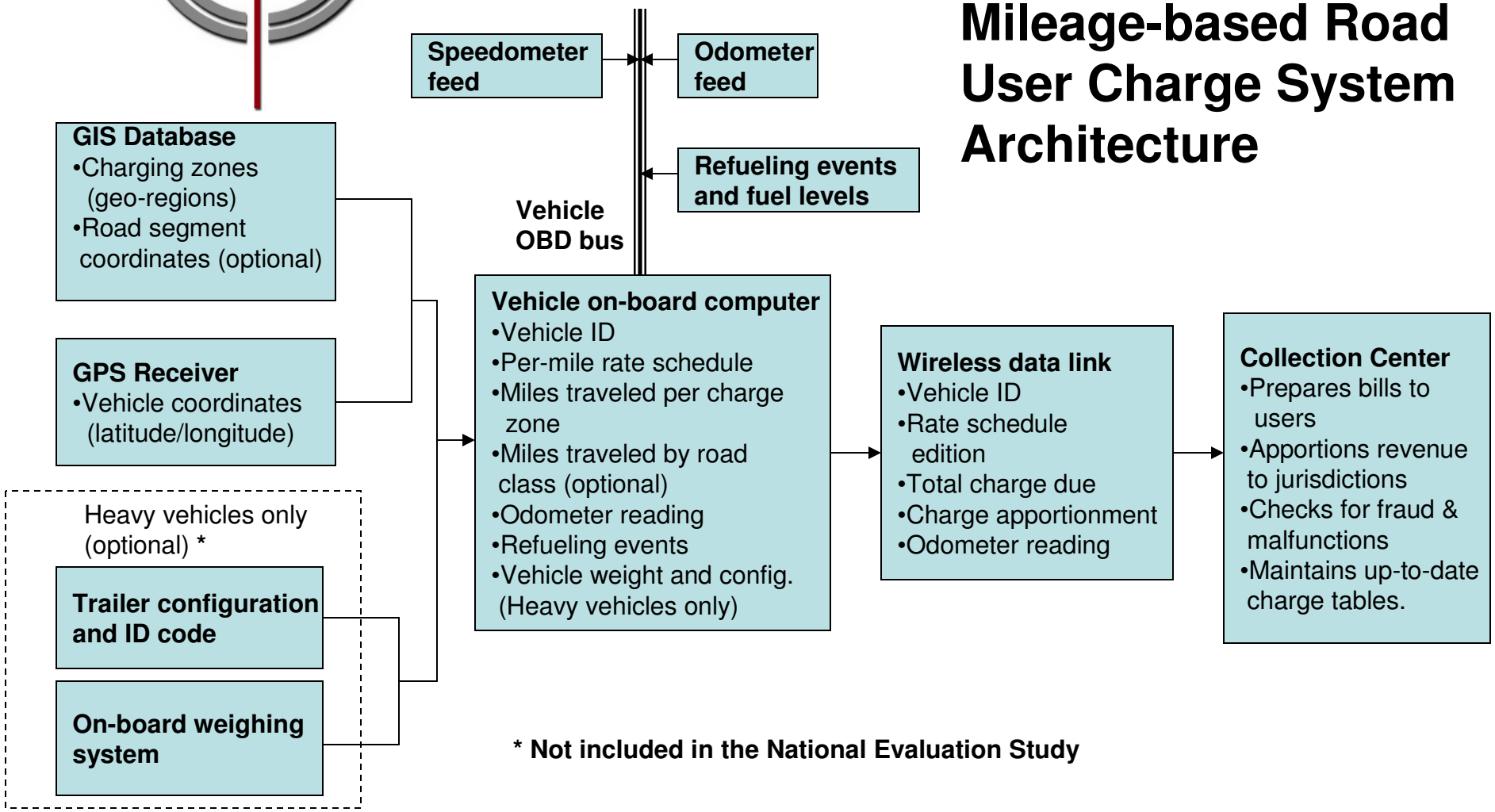


Mileage-based Road User Charging

Mileage-based Road User Charge System Architecture



*** Not included in the National Evaluation Study**

Basic System Operation

- As the vehicle travels, the on-board computer uses the GPS system to determine the current vehicle location and distance traveled
- The GIS database and rate table are interrogated to determine the current jurisdiction and charge rate.
- Accrued charges are maintained for each jurisdiction in which the vehicle travels
- Charges are periodically uploaded to a billing and dispersal center via the wireless communication link
- A variety of payment options could be used ranging from sending of a billing statement to automatic deduction from a credit card or bank account.
- Updates to GIS database and/or rate table can downloaded to the vehicle via the wireless link as necessary.

Important Considerations

- The on-board unit stores and reports only the total amount owed for each jurisdiction. No detailed route or time information is collected
- Data encryption techniques are used to further enhance system privacy and security
- Any number of vehicle classes can be created, each with their own per mile charge rates, thus enabling a wide range of public policy options
- The system can handle multiple levels of RUC jurisdiction—e.g. federal, state, county, city, etc.
- This system could be integrated with other road financing and traffic management options including congestion pricing and electronic tolling.
- The system could be implemented on any type of vehicle regardless of propulsion system or fuel type.

National Evaluation Study

- Two-year field study commenced in Fall of 2008
- Total of 12 sites nationwide
- 2700 total participants
- Each participant will have the mileage-based charge system installed in their vehicle for approximately 10 months
- Road user charge data is collected and reported and simulated billing statements are distributed to participants on a monthly basis
- A battery of questionnaires is administered to participants to assess perceptions, attitudes and acceptance

Mileage-based Road User Charging

National Evaluation Study Sites—Year I

National Evaluation Study Sites-Year 2 (tentative)

- Portland, Maine
- Miami, Florida
- Chicago, Illinois
- Wichita, Kansas
- Albuquerque, New Mexico
- Billings, Montana

Study Design

- Participants are selected to reflect community demographics with respect to:
  - Age
  - Sex
  - Level of educational attainment
  - Driving habits
- Subjects receive modest compensation for participation
- On-board Units are professionally installed under the dashboard--not visible to driver.
- Attitudinal surveys are administered at approximately six week intervals.

Mileage-based Road User Charging

- Progress to date:
  - 1,200 participants for year-one were chosen from over 40,000 qualified applicants
  - Participant training and OBU installation began in October, 2008 and was completed in December
  - To date, more than 5 million travelled miles have been reported, accounting for approx. $120K in user fees.

Mileage-based Road User Charging

- Future Roadmap:
  - Recruitment of 1,500 new participants will begin in Summer of 2009
  - Participant training and OBU installation for year-two will begin in late summer, 2009
  - In-field operations will be complete in early fall, 2010
  - Total reported mileage for the two-year study should be approx. 25 Million miles

Mileage-based Road User Charging

- Some Preliminary Observations:
  - Participants' level of acceptance mileage-based charging appears to increase after several months of participation in the study.
  - GPS is markedly less accurate than vehicle odometer as a means of measuring miles travelled.
  - Retrofitting an OBU to a wide variety of vehicles is very difficult process
    - Bus standards aren't standard
    - Modern vehicle electronic systems are often very fragile

Concluding Remarks

- There is widespread concern at both the federal and state levels about the long-term viability of the motor fuel tax
- Several federal commissions have forecast the impending demise of the motor fuel tax and recommended a transition to a mileage-based fee
- The national evaluation of a mileage-based road user charge, along with other state-level will provide important information to inform the debate and dialog on this important transition.

References and Links

Special Report 285: The Fuel Tax and Alternatives for Transportation Funding, Transportation Research Board, Committee for the Study of the Long-term Viability of the Fuel Tax for Transportation Finance, 2006. Available on-line at:

- http://onlinepubs.trb.org/Onlinepubs/sr/sr285.pdf

National Surface Transportation Policy and Revenue Study Commission: http://transportationfortomorrow.org/

National Surface Transportation Infrastructure Financing Commission: http://financecommission.dot.gov/

Contact Information

- For additional information regarding the U.S. National Evaluation of a Mileage-based Road User Charge, contact:

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