“MBUF Demo”
“Mn Road Fee Test”
“IntelliDrive Connected Vehicles for Safety, Mobility and User Fee”

Cory Johnson, PE
Office of Traffic, Safety, and Technology
MnDOT
Statutory Direction

"$5,000,000 is for a pilot project to demonstrate technologies that will allow for the future replacement of the gas tax with a fuel-neutral mileage charge."

MnDOT Appropriations Bill 2007
# State and Federal Gas Taxes
Paid Annually

<table>
<thead>
<tr>
<th>(taxes per year)</th>
<th>Light Duty Truck (20 mpg)</th>
<th>Passenger Car (30 mpg)</th>
<th>Hybrid (40 mpg)</th>
<th>Electric Vehicle (non-gas powered)</th>
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</thead>
<tbody>
<tr>
<td><strong>State Tax</strong></td>
<td><strong>Federal Tax</strong></td>
<td><strong>State Tax</strong></td>
<td><strong>Federal Tax</strong></td>
<td><strong>State Tax</strong></td>
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<tr>
<td>20,000 miles/year</td>
<td>$280</td>
<td>$184</td>
<td>$187</td>
<td>$140</td>
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<tr>
<td></td>
<td>$184</td>
<td>$123</td>
<td></td>
<td>$92</td>
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<tr>
<td></td>
<td>$140</td>
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<td></td>
<td>$0</td>
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<tr>
<td>15,000 miles/year</td>
<td>$210</td>
<td>$138</td>
<td>$140</td>
<td>$105</td>
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<tr>
<td></td>
<td>$140</td>
<td>$92</td>
<td></td>
<td>$69</td>
</tr>
<tr>
<td></td>
<td>$140</td>
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<td></td>
<td>$0</td>
</tr>
<tr>
<td>10,000 miles/year</td>
<td>$140</td>
<td>$92</td>
<td>$93</td>
<td>$70</td>
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<td></td>
<td>$93</td>
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<td></td>
<td>$46</td>
</tr>
<tr>
<td></td>
<td>$93</td>
<td></td>
<td></td>
<td>$0</td>
</tr>
<tr>
<td>Equivalent cents/mile</td>
<td>1.40</td>
<td>0.92</td>
<td>0.93</td>
<td>0.70</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.61</td>
<td></td>
<td>0.46</td>
</tr>
<tr>
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</table>

* Minnesota tax on gasoline is $0.28 per gallon as of publication.
** Federal tax on gasoline is $0.184 per gallon as of publication.
Miles Based User Fees: a Two-Part Research Effort

1. Technology Demonstration
   - 500 volunteers from Wright County, MN
   - Existing smart phone and cellular communications

2. Policy Study
   - Engage key stakeholders to identify and evaluate MBUF
   - Report policy level recommendations to MnDOT
   - Commissioner
Policy Approach – U of MN

1. Legislative & Executive Briefings
   • Elected Officials

2. Internet Panel Survey
   • General Public

3. Stakeholder Interviews
   • Elected Officials
   • Public Agencies
   • Business/Industry Groups
   • Opinion Leaders
   • Environmental/Social Justice Groups

4. Greater Minnesota Listening Sessions
   • Greater MN Stakeholders
   • Elected Officials
   • Public Agencies
   • Business/Industry Groups
   • Opinion Leaders

5. Expert Panel Roundtables
   • Elected Officials
   • Public Agencies
   • Business/Industry Groups
   • Opinion Leaders
   • Environmental/Social Justice
   • General Public

6. Project Leadership Group & Project Management Team
   • Public Agencies
Demonstration Approach

- Battelle to design, build, and test the technology
- SAIC to recruit the volunteers and evaluate the demonstration
- Three test waves of approximately 175 each

- Final report scheduled to be released - Dec. 2012
Study Design Overview

- Participation is voluntary and can be changed on a trip-by-trip basis
- Will have before/after odometer readings to compare to GPS readings
- Will have information on the number of times user opted out
Technology Requirements

• Develop software and hardware systems to conduct a demonstration of mileage-based user fees (MBUF)

• Demonstration is:
  – Using Commercial Off-The-Shelf (COTS) hardware
    - Deploying 500 in-vehicle devices & back office processing system
  – Capturing, invoicing, and handling payments associated with MBUFs
    - Permit a comparison of technology vs. odometer readings
  – Also deploy Value Added Services
    - Navigation, Safety Signage & “Trip” Data Collection
System Concept

In-Vehicle Smartphone

Electronic Odometer Mileage by Fee Category

Communication packets

Cellular Tower

Data Warehouse

GPS Position is NOT being transmitted for the Fee Assessment
In-Vehicle Hardware Overview

**Samsung Galaxy S**
- In-Vehicle Computational Device and Display Unit

**OBD-II Blue tooth Tool**
- STN1110 With Bluetooth Data Connection

**COTS Mounting Hardware and Cables**
What Does a Participant See?

- MBUF Rate
- Interstate Notification
- MBUF Geography

Date mileage was last sent
Miles recorded
Estimated Fee

Current Fee: 3.5¢
Version: 1.1.0
MBUF – How it works

• Designed as a “thick client”
• MBUF application accumulates mileage driven by fee category (roadway type, geography, etc.)
• Every 24 hours accumulated mileage by fee category transmitted via cellular to data warehouse
• Invoice generated monthly based upon aggregate miles in fee categories
• Participant pays monthly billing
Disputing the Fee Calculation Option

• “Trip” application captures vehicle location every second and sends this to infrastructure every 20 seconds.
• “Trip” does not contain ability to link a participant to a route, only a participant can do this

<table>
<thead>
<tr>
<th>MBUF Application</th>
<th>Trip Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Stores accumulated miles by road rate category in OBU</td>
<td>• Latitude/Longitude on second-by-second basis</td>
</tr>
<tr>
<td>• Transmits cumulative miles by category and vehicle ID to Infrastructure no more than once per day</td>
<td>• Transmitted to Infrastructure every 20 seconds</td>
</tr>
<tr>
<td>• No information on individual trips</td>
<td>• Contains a TRIP identifier (ID) but no information on vehicle or person</td>
</tr>
</tbody>
</table>
# Status of Evaluation Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Wave A</th>
<th>Wave B</th>
<th>Wave C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recruitment</td>
<td>196 recruited</td>
<td>210 recruited</td>
<td>260 Recruited</td>
</tr>
<tr>
<td></td>
<td>146 began test in Sept</td>
<td>165 began test in Dec</td>
<td>189 Scheduled for Odometer Reading #1</td>
</tr>
<tr>
<td></td>
<td>137 completed the test</td>
<td>162 currently active</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 participants pending</td>
<td></td>
<td></td>
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<tr>
<td>Survey #1</td>
<td>Complete</td>
<td>Complete</td>
<td>Live: 5/14-5/28</td>
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<tr>
<td></td>
<td>142 out of 146 (97%)</td>
<td>162 out of 165 (98%)</td>
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<tr>
<td>Survey #2</td>
<td>Complete</td>
<td>Complete</td>
<td>Live: 7/11-7/25</td>
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<tr>
<td></td>
<td>136 out of 141 (96%)</td>
<td>157 out of 162 (97%)</td>
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<tr>
<td>Survey #3</td>
<td>Complete</td>
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<td>Live: 10/3-10/17</td>
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<td></td>
<td>132 out of 139 (95%)</td>
<td>Live: 5/21-6/4</td>
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<tr>
<td>Focus Groups</td>
<td>Completed 2/28 &amp; 2/29</td>
<td>May 22 and 23</td>
<td>early Oct</td>
</tr>
<tr>
<td>Observing Odometer Readings</td>
<td>Observed #1 9/20-9/21</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Observed #2 11/21-11/22</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Observed #3 3/20-3/21</td>
<td></td>
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</tr>
<tr>
<td>One-on-one Interviews</td>
<td>Complete</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>127 out of 139 (91%)</td>
<td>May / June</td>
<td>Oct / Nov</td>
</tr>
</tbody>
</table>
Minnesota’s MBUF: Summary

1. Technology Demonstration
   – Field test is going well and about 60% complete
   – Technology is working very well and should deliver a wealth of detailed data
   – Final Report expected Dec 2012

2. Policy Study
   – Legislative and key stakeholders have been engaged
   – Task force reported completed
   – Transportation finance advisory committee effort started
Minnesota Mileage Based User Fee Program

QUESTIONS or COMMENTS?
Coryj.johnson@state.mn.us

Reports Available at:
http://www.dot.state.mn.us/mileagebaseduserfee/index.html