Smart Driving Pilots

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BECC Conference
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Metropolitan Transportation Commission

- Created by the California Legislature in 1970
- Jurisdiction includes all 9 Bay Area counties
- Governed by 21-member board of primarily local elected officials
- Responsibilities include:
  - Planning
  - Funding
  - Coordination
  - Operations
  - Advocacy
California Climate Change Legislation

• Assembly Bill 32: Global Warming Solutions Act
  • Sets the state GHG emissions limit in 2020 at 1990 levels and points the way towards 80% reduction by 2050

• Senate Bill 375: Sustainable Communities Strategy
  • Requires the integration of land use and transportation planning in a Sustainable Communities Strategy (SCS) to reduce emissions from light duty vehicles

Per Capita Light Duty Vehicle Emission Reduction Targets
Goals of MTC’s Climate Program

- Meet SB 375 GHG emission reduction requirements that mandate the region to reduce GHG emissions
- Test innovative transportation strategies/technologies that reduce GHG emissions, VMT, single occupancy vehicle travel, and support mode shift
- Promote co-benefits, such as improved public health and reduced transportation costs
- Replicate successful projects throughout the region
Plan Bay Area invests $630m over 25 years in Climate Program activities

<table>
<thead>
<tr>
<th>Policy Initiative</th>
<th>2035 Cost in YOE millions</th>
<th>Per Capita CO₂ Emissions Reductions in 2035</th>
<th>Cost per GHG Ton Reduced in 2035</th>
<th>Funds Expended to Date (in millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commuter Benefits Ordinance</td>
<td>$0</td>
<td>-0.3%</td>
<td>$0</td>
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</tr>
<tr>
<td>Car Sharing</td>
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<td>-2.6%</td>
<td>$14</td>
<td>$2</td>
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<tr>
<td>Vanpool Incentives</td>
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<td>-0.4%</td>
<td>$29</td>
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</tr>
<tr>
<td>Clean Vehicles Feebate Program</td>
<td>$25</td>
<td>-0.7%</td>
<td>$108</td>
<td>--</td>
</tr>
<tr>
<td>Smart Driving Strategy</td>
<td>$160</td>
<td>-1.5%</td>
<td>$322</td>
<td>$.9</td>
</tr>
<tr>
<td>Vehicle Buy-Back &amp; Plug-in or Electric Vehicle Purchase Incentive</td>
<td>$120</td>
<td>-0.5%</td>
<td>$684</td>
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<tr>
<td>Regional Electric Vehicle Charger Network</td>
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<td>-0.3%</td>
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<td>Climate Initiatives Innovative Grants</td>
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<td>TBD</td>
<td>$44</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>$630</strong></td>
<td><strong>-6.3%</strong></td>
<td><strong>$47.3</strong></td>
<td></td>
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</table>
Conducted Market Research in 2011

• **All behavior changes are not equal**
  • SMART driving (modifying driving style or vehicle) is viewed as comparatively easy actions to take
  • Trip reduction/trip modification actions are mixed – trip linking and reducing a trip are viewed as easy, telecommuting and flex-schedules were difficult
  • Mode or vehicle shift are perceived as the most difficult actions to take, with walking being a possible exception

• **Themes & motivators**
  • Altruistic factors were the most compelling – keep Bay Area beautiful for future generations, protect the environment, protect public health
  • Self-interested factors included better for their health, reduce energy use, save time & save money
Existing Smart Driving Research

• U.S. study found 2.7 average reduction in fuel consumption:
  • A 2013 study by Kurani et al. found a 2.7% reduction in fuel consumption using in-vehicle devices (CA and NV)

• European studies found up to 22.5% reduction in fuel consumption:
  • Eco:Drive Fiat studied their app, which yielded a 6% average reduction in fuel consumption (Europe)
  • European insurance companies tracked the number of insurance claims before and after the introduction of smart driving campaigns and found a reduction in claims from between 14% and 35%
Smart Driving Pilots

1. **MTC/ICF Pilot**: tested effectiveness of in-vehicle, real time device and smart driving education on MPG savings.

2. **UC Davis Pilot**: tested effectiveness of four smart phone app types, displayed while driving, on MPG savings.
MTC/ICF Pilot

• Began Pilot in late 2012 by recruiting participants on 511.org website

• Developed educational elements that would be sent to all participants (Powerpoints with video) and also used social media to engage participants

• Used two devices: OBD Key (to accurately measure vehicle performance) and Ecometer (to provide instant feedback in-vehicle).

• Began installing in-vehicle devices in 2013; half received Ecometer, half did not; all received smart driving lessons

• Conducted two waves of testing

• Total of 23 participants completed pilot
MTC/ICF Pilot Results Overview

• Pilots showed promising, yet varied results:
  • Ecometer resulted in only a small (1.6%) improvement in fuel economy (not statistically significant)
  • Lessons alone actually decreased fuel efficiency by 3% (not statistically significant)
  • Ecometer reduced hard accelerations by 20% and high speed travel by 10-16%
  • Participant trips were 9% shorter following the installation of the Ecometer
MTC/ICF Pilot Results

Pilot Overview

• Twenty three people completed pilot:
  • 19 cars
  • 3 SUVs
  • 1 Minivan

• Ecometer + OBD Key + Educational Elements = 12 participants
• OBD Key + Educational Elements = 11 participants

Pilot Parameters:
• Fuel economy was averaged across all 23 vehicles during the baseline period and the test period.
• A 95% confidence interval (95% CI) was also calculated for the data to show its statistical significance.
MTC/ICF Pilot Results, cont.

Aggressive Driving

<table>
<thead>
<tr>
<th>Test</th>
<th>Baseline</th>
<th>Test</th>
<th>Difference</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>AD</td>
<td>AD</td>
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<tr>
<td></td>
<td>95% CI</td>
<td>95% CI</td>
<td></td>
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<tr>
<td>Ecometer</td>
<td>6.5%</td>
<td>5.3%</td>
<td>-19.3%</td>
</tr>
<tr>
<td>Lessons</td>
<td>7.4%</td>
<td>9.1%</td>
<td>23.3%</td>
</tr>
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- OBDKey recorded a measure of aggressive driving.
- Assumption of a 30 degree throttle angle to indicate rapid acceleration.
- Aggressive driving was reduced however, the change was not statistically significant due to the variation in values.

Over Speeding

<table>
<thead>
<tr>
<th>Test</th>
<th>Baseline</th>
<th>Test</th>
<th>Difference</th>
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<tbody>
<tr>
<td></td>
<td>OS</td>
<td>OS</td>
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<tr>
<td></td>
<td>95% CI</td>
<td>95% CI</td>
<td></td>
</tr>
<tr>
<td>Ecometer</td>
<td>29.7%</td>
<td>26.3%</td>
<td>-11.6%</td>
</tr>
<tr>
<td>Lessons</td>
<td>26.3%</td>
<td>25.0%</td>
<td>-4.9%</td>
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- The OBDKeys also recorded miles driven over 65 mph.
- Over speeding was reduced by the program. However, the change was not statistically significant due to the variation in values.
- The three vehicles that drove over 40% of their miles speeding reduced over speeding by 11% due to the Smart Driving program.
MTC/ICF Pilot Results, cont.

Trip Length

<table>
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<th>Test</th>
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<tbody>
<tr>
<td></td>
<td>miles</td>
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<td>95% CI</td>
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<tr>
<td>Ecometer</td>
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<td>1.84</td>
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<tr>
<td>Lessons</td>
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<td>9.39</td>
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</tr>
<tr>
<td></td>
<td>1.62</td>
<td>1.39</td>
<td>-0.23</td>
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- Reduction in trip length affects fuel economy by decreasing the portion of the time spent driving at more efficient speeds (~45 to 60 mph)
- May be an indication of trip chaining which can reduce emissions due to lower cold starts
- **Average trip length decreased by 9% (statistically significant)**, which likely contributed to limited fuel economy gains, since shorter trips tend to be less fuel efficient.

Adjusted Results

<table>
<thead>
<tr>
<th>Test</th>
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<th>Test</th>
<th>Difference</th>
</tr>
</thead>
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<td></td>
<td>miles</td>
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<tr>
<td></td>
<td>MPG</td>
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<tr>
<td></td>
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<td>95% CI</td>
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<tr>
<td>Ecometer</td>
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<td>28.23</td>
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<td>Lessons</td>
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<tr>
<td></td>
<td>5.41</td>
<td>5.46</td>
<td>-0.05</td>
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</table>

- Improvement in fuel economy for the Ecometer group when adjusted for trip length and average speed, but the results are still not statistically significant
- Ecometer provided small positive benefits for the test groups, while the lessons alone had a small negative effect.
UC Davis Pilot

• Tested four variations of driver feedback Android app:
  1. Numerical per-trip score
  2. Trip ranking comparing trip to other participants’
  3. Trip ranking with fuel cost
  4. Trip ranking with GHG emission info
UC Davis Study, cont.

- Used Facebook and 511.org to attract 545 pilot participants
- Of those, 70 participants completed pilot
- The experiment tested both the effect of any driving feedback and the effectiveness of personal vs. social rank feedback
UC Davis Pilot Results

• The app type had a strong effect on the result:
  • The numerical per trip score type was most effective, providing a 15.5% reduction in fuel consumption (statistically discernable at the 95% confidence rate)
  • The social rank views had no statistically discernable effect.
Lessons Learned

• Small sample size makes it difficult to come to significant findings
• Devices difficult to install, program and obtain accurate results
• Participants found devices fun and useful
• Given varied yet promising results, we are moving forward with a larger pilot program
Smart Driving Program
Phase 2

• MTC and ICF have continued smart driving effort
• Partnering with Automatic on distribution of discounted devices to Bay Area public
• Creating smart driving video and other educational elements to enhance Automatic’s information
• Planning to launch in January 2016
Thank you!

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