Potential User Benefits and Costs of Rising Fuel Prices in the Puget Sound Region

TRB Planning Applications Conference

May 18, 2009

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Puget Sound Regional Council
Objective

To Understand the Potential Impacts on Travel of Rising (and Falling) Gas Prices

- Trips by type
- Trip lengths
- Mode choices
- Vehicle miles traveled

To Measure the Potential User Benefits of Rising (and Falling) Gas Prices

- Time and reliability savings
- Costs
- Emissions
Definitions

- Vehicle operating costs include fuel and maintenance costs
- Effective vehicle operating costs accounts for the interaction between fuel costs and fleet efficiency

Assumptions

- Future trends in fuel costs will affect average fleet efficiency
- CAFÉ standards and other regulatory efforts will have an effect on new additions to the fleet, but average fuel efficiency trails standards significantly due to less efficient vehicles remaining in the fleet

Vehicle Classes

- Autos and light trucks
- Medium and heavy trucks
Forecast Trend in Fuel Cost per Miles Traveled (Index Feb1987=1)

Source: ECONorthwest from a partial adjustment, econometric model estimated on US vehicle fleet data, using EIA DOE price forecasts.
CAFÉ Standards and New Fleet Achieved Fuel Efficiency

Source: Pew study, op cit.
Trend in Maintenance Cost per Vehicle Miles Traveled
Range of Operating Costs for Sensitivity Testing

Operating costs in cents per mile (2000 dollars)

<table>
<thead>
<tr>
<th>Year</th>
<th>Autos</th>
<th>Trucks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mid</td>
<td>High</td>
</tr>
<tr>
<td>2006</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>2030</td>
<td>15</td>
<td>34</td>
</tr>
</tbody>
</table>
Low and high auto operating costs were compared to the base alternative in each case:

- Baseline – currently funded projects
- Alternative 1 – emphasize efficiency through demand and system management projects
- Alternative 5 – reduce emissions through limited highway improvements, significant transit improvements and regional tolling
### Vehicles Owned and Trips Made

#### Total Daily Travel (Vehicles Owned and Daily Person Trips Made by Households)

<table>
<thead>
<tr>
<th>Scenario</th>
<th>2006 Base Year</th>
<th>2040 Baseline</th>
<th>Base Low</th>
<th>Base High</th>
<th>Alt 5</th>
<th>Alt 5 Low</th>
<th>Alt 5 High</th>
<th>Alt 1</th>
<th>Alt 1 High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicles Owned</td>
<td>2,587,000</td>
<td>3,841,000</td>
<td>3,845,000</td>
<td>3,834,000</td>
<td>3,826,000</td>
<td>3,830,000</td>
<td>3,815,000</td>
<td>3,842,000</td>
<td>3,832,000</td>
</tr>
<tr>
<td>Non-work Trips</td>
<td>11,563,144</td>
<td>15,989,797</td>
<td>16,001,221</td>
<td>15,961,864</td>
<td>15,984,233</td>
<td>15,997,360</td>
<td>15,955,637</td>
<td>15,992,962</td>
<td>15,955,589</td>
</tr>
</tbody>
</table>

#### Graphical Representation

The graph shows the percent change from the base case for Vehicles Owned, Work Trips, and Non-Work Trips across different scenarios.
### Average Daily Trip Lengths (Times in Minutes, Lengths in Miles)

#### Trip Times

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Year</th>
<th>Baseline</th>
<th>Base Low</th>
<th>Base High</th>
<th>Alt 5</th>
<th>Alt 5 Low</th>
<th>Alt 5 High</th>
<th>Alt 1</th>
<th>Alt 1 High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work</td>
<td>2006</td>
<td>36</td>
<td>42</td>
<td>45</td>
<td>40</td>
<td>42</td>
<td>42</td>
<td>41</td>
<td>38</td>
</tr>
<tr>
<td>Non-work</td>
<td></td>
<td>18</td>
<td>18</td>
<td>20</td>
<td>16</td>
<td>16</td>
<td>17</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>21</td>
<td>22</td>
<td>24</td>
<td>20</td>
<td>20</td>
<td>21</td>
<td>19</td>
<td>21</td>
</tr>
</tbody>
</table>

#### Trip Lengths

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<th>Base High</th>
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<th>Alt 5 Low</th>
<th>Alt 5 High</th>
<th>Alt 1</th>
<th>Alt 1 High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work</td>
<td>2006</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>Non-work</td>
<td></td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>7</td>
<td>6</td>
<td>7</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>7</td>
</tr>
</tbody>
</table>

### Percent Change from the Base Case

- **Trip Times**
  - Base Low: 10%
  - Base High: 10%
  - Alt 5 Low: 5%
  - Alt 5 High: 10%
  - Alt 1 High: 5%

- **Trip Lengths**
  - Base Low: 0%
  - Base High: 0%
  - Alt 5 Low: 0%
  - Alt 5 High: 0%
  - Alt 1 High: 0%
### Average Daily Trips by Mode and Vehicle Type

<table>
<thead>
<tr>
<th>Scenario</th>
<th>2006 Base</th>
<th>Year</th>
<th>Baseline</th>
<th>Base Low</th>
<th>Base High</th>
<th>Alt 5</th>
<th>Alt 5 Low</th>
<th>Alt 5 High</th>
<th>Alt 1</th>
<th>Alt 1 High</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOV</td>
<td>5,833,000</td>
<td>8,291,000</td>
<td>8,415,000</td>
<td>8,027,000</td>
<td>7,967,000</td>
<td>8,081,000</td>
<td>7,683,000</td>
<td>8,239,000</td>
<td>7,921,000</td>
<td></td>
</tr>
<tr>
<td>Carpool</td>
<td>5,822,000</td>
<td>7,589,000</td>
<td>7,603,000</td>
<td>7,524,000</td>
<td>7,492,000</td>
<td>7,527,000</td>
<td>7,397,000</td>
<td>7,610,000</td>
<td>7,544,000</td>
<td></td>
</tr>
<tr>
<td>Transit</td>
<td>386,000</td>
<td>793,000</td>
<td>799,000</td>
<td>787,000</td>
<td>983,000</td>
<td>976,000</td>
<td>1,002,000</td>
<td>906,000</td>
<td>925,000</td>
<td></td>
</tr>
<tr>
<td>Walk/Bike</td>
<td>1,405,000</td>
<td>2,281,000</td>
<td>2,169,000</td>
<td>2,562,000</td>
<td>2,515,000</td>
<td>2,400,000</td>
<td>2,811,000</td>
<td>2,226,000</td>
<td>2,513,000</td>
<td></td>
</tr>
</tbody>
</table>

#### Modal Choices

![Chart showing change in modal trips for different scenarios.]
## Daily Vehicle Miles Traveled

### Vehicle Miles Traveled (Average miles per day by category)

<table>
<thead>
<tr>
<th>Scenario</th>
<th>2006 Base</th>
<th>2040 Baseline</th>
<th>Base Low</th>
<th>Base High</th>
<th>Alt 5</th>
<th>Alt 5 Low</th>
<th>Alt 5 High</th>
<th>Alt 1</th>
<th>Alt 1 High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak</td>
<td>30,078,600</td>
<td>35,519,700</td>
<td>37,466,200</td>
<td>34,014,300</td>
<td>32,689,900</td>
<td>33,943,100</td>
<td>29,993,800</td>
<td>38,720,000</td>
<td>35,965,600</td>
</tr>
<tr>
<td>Offpeak</td>
<td>48,358,400</td>
<td>65,355,600</td>
<td>67,433,900</td>
<td>57,833,600</td>
<td>59,558,100</td>
<td>62,427,000</td>
<td>53,016,100</td>
<td>66,334,100</td>
<td>58,133,400</td>
</tr>
<tr>
<td>Auto</td>
<td>59,543,700</td>
<td>76,974,500</td>
<td>80,386,300</td>
<td>70,855,900</td>
<td>69,988,800</td>
<td>72,583,400</td>
<td>61,870,900</td>
<td>80,201,300</td>
<td>70,466,300</td>
</tr>
<tr>
<td>Truck</td>
<td>5,913,400</td>
<td>8,485,400</td>
<td>8,459,300</td>
<td>8,284,700</td>
<td>8,882,400</td>
<td>9,049,700</td>
<td>8,377,200</td>
<td>8,977,200</td>
<td>8,765,200</td>
</tr>
</tbody>
</table>

### Bar Chart

- **Peak**
- **Offpeak**
- **Auto**
- **Truck**

Percent Change from the Base Case:

- **Base Low**
- **Base High**
- **Alt 5 Low**
- **Alt 5 High**
- **Alt 1 High**
Percent Change in Emissions from Base Case

-15.0%  -10.0%  -5.0%  0.0%  5.0%  10.0%

B-Low  B-High  Alt 1-High  Alt 5-Low  Alt 5-High

CO2  CO  NOx  VOC  PM2.5
Annual Mobility Benefits Relative to the Base Case
(millions of 2008 dollars)

- B-Low
- B-High
- Alt 1-High
- Alt 5-Low
- Alt 5-High

SOV Benefits
Transit Benefits
HOV Benefits
Light Commercial Benefits
Med & Heavy Trucks
Summary of Results

Elasticities with respect to Auto Operating Cost

- Auto Person Trips
- Walk to Transit Trips
- Bike/Walk Trips
- CO2 Emissions
- Auto VMT
- Drive to Transit Trips
- Auto Vehicle Trips
- Truck VMT
- Drive to Transit Trips
- Auto Vehicle Trips
Summary

Auto VMT and CO2 emissions have the highest decrease of all travel measures as gas prices increase. Truck VMT also decreases, but at a lower rate due to higher values of time.

Drive to transit, bike and walk trips have the highest increase of all measures as gas prices increase. Walk to transit trips are relatively inelastic.

Work trips made decrease as gas prices increase more than non-work trips.