Use of Alternative Fuels and Hybrid Vehicles by Small Urban and Rural Transit Systems

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Survey Overview

• Survey of 115 rural and small urban transit systems on use of:
  • Biodiesel
  • E85
  • Propane
  • CNG
  • Hybrid-electric vehicles
• Conducted April 2011
• Main topics
  • Use
  • Satisfaction
  • Problems
  • Perceived benefits/reasons for adoption
  • Deterrents
## Number of Transit Agencies Surveyed

<table>
<thead>
<tr>
<th></th>
<th>Targeted</th>
<th>Surveys Sent</th>
<th>Surveys Successfully Delivered</th>
<th>Survey Responses Submitted</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Small Urban</strong></td>
<td>394</td>
<td>305</td>
<td>NA</td>
<td>54+</td>
</tr>
<tr>
<td><strong>Large Rural</strong></td>
<td>270</td>
<td>245</td>
<td>NA</td>
<td>37+</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>664</td>
<td>550</td>
<td>496</td>
<td>115</td>
</tr>
</tbody>
</table>
Locations of Transit Agencies Responding to Survey
Alternative Fuel and Hybrid Vehicle Use by Responding Agencies

- Biodiesel: 31
- E85: 8
- Propane: 4
- CNG: 10
- Hybrid-electric: 24

Number of transit agencies
## Use of Alternative Fuels and Hybrid Vehicles, by Urban and Rural

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>Urban Yes</th>
<th>Urban No</th>
<th>Rural Yes</th>
<th>Rural No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biodiesel</td>
<td>18 (38%)</td>
<td>30 (63%)</td>
<td>3 (12%)</td>
<td>23 (88%)</td>
</tr>
<tr>
<td>Flex Fuel Vehicle</td>
<td>16 (30%)</td>
<td>38 (70%)</td>
<td>10 (27%)</td>
<td>27 (73%)</td>
</tr>
<tr>
<td>E85 in FFV</td>
<td>3 (19%)</td>
<td>13 (81%)</td>
<td>3 (27%)</td>
<td>8 (73%)</td>
</tr>
<tr>
<td>Propane</td>
<td>2 (4%)</td>
<td>52 (96%)</td>
<td>2 (5%)</td>
<td>35 (95%)</td>
</tr>
<tr>
<td>CNG</td>
<td>7 (13%)</td>
<td>47 (87%)</td>
<td>2 (5%)</td>
<td>35 (95%)</td>
</tr>
<tr>
<td>Hybrids</td>
<td>19 (35%)</td>
<td>35 (65%)</td>
<td>3 (8%)</td>
<td>34 (92%)</td>
</tr>
</tbody>
</table>
Locations of Responding Agencies that use Alternative Fuels or Hybrids:

(a) Biodiesel
(b) E85
(c) Propane
(d) CNG
(e) Hybrids
# Satisfaction Reported by Users

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>n</th>
<th>Very Satisfied</th>
<th>Somewhat Satisfied</th>
<th>Neither Satisfied nor Dissatisfied</th>
<th>Somewhat Dissatisfied</th>
<th>Very Dissatisfied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biodiesel</td>
<td>22</td>
<td>27%</td>
<td>36%</td>
<td>14%</td>
<td>18%</td>
<td>5%</td>
</tr>
<tr>
<td>E85</td>
<td>7</td>
<td>29%</td>
<td>0%</td>
<td>57%</td>
<td>14%</td>
<td>0%</td>
</tr>
<tr>
<td>Propane</td>
<td>4</td>
<td>0%</td>
<td>75%</td>
<td>25%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>CNG</td>
<td>9</td>
<td>56%</td>
<td>44%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Hybrid-electric</td>
<td>24</td>
<td>50%</td>
<td>17%</td>
<td>8%</td>
<td>8%</td>
<td>17%</td>
</tr>
</tbody>
</table>
Reasons for Adopting Biodiesel

- Fuel cost savings: 5% Major reason, 38% Minor reason, 57% Not a reason
- Positive performance impacts of the fuel: 14% Major reason, 62% Minor reason, 24% Not a reason
- Improving public perception: 71% Major reason, 29% Not a reason
- Political directives: 41% Major reason, 36% Minor reason, 23% Not a reason
- Desire to utilize local resources and products: 24% Major reason, 52% Minor reason, 24% Not a reason
- Energy dependency concerns: 29% Major reason, 52% Minor reason, 19% Not a reason
- Reducing emissions: 38% Major reason, 57% Minor reason, 5% Not a reason
# Deterrents before Adoption by Biodiesel Users

<table>
<thead>
<tr>
<th>Deterrent</th>
<th>Not a Deterrent</th>
<th>Minor Deterrent</th>
<th>Major Deterrent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of information</td>
<td>76%</td>
<td>29%</td>
<td>14%</td>
</tr>
<tr>
<td>NOx emissions</td>
<td>62%</td>
<td>10%</td>
<td>29%</td>
</tr>
<tr>
<td>Engine warranty</td>
<td>38%</td>
<td>29%</td>
<td>33%</td>
</tr>
<tr>
<td>Fuel quality</td>
<td>24%</td>
<td>48%</td>
<td>29%</td>
</tr>
<tr>
<td>Adequate/dependable fuel supply</td>
<td>43%</td>
<td>38%</td>
<td>19%</td>
</tr>
<tr>
<td>Cold weather performance</td>
<td>19%</td>
<td>43%</td>
<td>33%</td>
</tr>
<tr>
<td>Reliability</td>
<td>38%</td>
<td>43%</td>
<td>19%</td>
</tr>
<tr>
<td>Maintenance issues</td>
<td>38%</td>
<td>33%</td>
<td>48%</td>
</tr>
<tr>
<td>Infrastructure cost</td>
<td>71%</td>
<td>24%</td>
<td>5%</td>
</tr>
<tr>
<td>Fuel mileage</td>
<td>57%</td>
<td>38%</td>
<td>5%</td>
</tr>
<tr>
<td>Fuel cost</td>
<td>24%</td>
<td>52%</td>
<td>29%</td>
</tr>
</tbody>
</table>

- **Major deterrent**
- **Minor deterrent**
- **Not a deterrent**
### Reported Problems with Biodiesel

<table>
<thead>
<tr>
<th>Issue</th>
<th>Major Problem</th>
<th>Minor Problem</th>
<th>No Greater Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adequate/dependable fuel supply</td>
<td>2</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>Fuel quality</td>
<td>3</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>Cold weather performance</td>
<td>5</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Reliability</td>
<td>4</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Maintenance</td>
<td>5</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>Fuel mileage</td>
<td>7</td>
<td>9</td>
<td>15</td>
</tr>
<tr>
<td>Fuel cost</td>
<td>7</td>
<td>9</td>
<td>6</td>
</tr>
</tbody>
</table>

0% 20% 40% 60% 80% 100%

- Major problem
- Minor problem
- No greater problem
# Deterrents for Agencies Not Using Biodiesel

<table>
<thead>
<tr>
<th>Deterrent</th>
<th>Major Deterrent</th>
<th>Minor Deterrent</th>
<th>Not a Deterrent</th>
<th>Don't Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of information</td>
<td>18</td>
<td>13</td>
<td>15</td>
<td>11</td>
</tr>
<tr>
<td>NOx emissions</td>
<td>9</td>
<td>11</td>
<td>11</td>
<td>21</td>
</tr>
<tr>
<td>Engine warranty</td>
<td>24</td>
<td>12</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>Adequate/dependable fuel supply</td>
<td>38</td>
<td>12</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Fuel quality</td>
<td>17</td>
<td>16</td>
<td>8</td>
<td>14</td>
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<tr>
<td>Cold weather performance</td>
<td>14</td>
<td>17</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>Reliability</td>
<td>14</td>
<td>18</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>Maintenance issues</td>
<td>28</td>
<td>10</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>Infrastructure cost</td>
<td>30</td>
<td>6</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>Fuel mileage</td>
<td>10</td>
<td>15</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Fuel cost</td>
<td>25</td>
<td>11</td>
<td>7</td>
<td>13</td>
</tr>
</tbody>
</table>

**Legends:**
- [Green] Major deterrent
- [Brown] Minor deterrent
- [Light Blue] Not a deterrent
- [Purple] Don't know
### Reasons for Adopting E85

<table>
<thead>
<tr>
<th>Reason</th>
<th>Major reason</th>
<th>Minor reason</th>
<th>Not a reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel cost savings</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Positive performance impacts of the fuel</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Improving public perception</td>
<td>1</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Political directives</td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Desire to utilize local resources and products</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Energy dependency concerns</td>
<td>2</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Reducing emissions</td>
<td>1</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Distribution</th>
<th>0%</th>
<th>20%</th>
<th>40%</th>
<th>60%</th>
<th>80%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major reason</td>
<td>23%</td>
<td>17%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor reason</td>
<td>33%</td>
<td></td>
<td>57%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not a reason</td>
<td>44%</td>
<td></td>
<td></td>
<td>43%</td>
<td></td>
<td>13%</td>
</tr>
</tbody>
</table>

- purple: Major reason
- green: Minor reason
- brown: Not a reason
Deterrents before Adoption of E85

- **Lack of information about E85**: 1 Major, 1 Minor, 5 Not a deterrent
- **Fuel quality**: 2 Major, 5 Not a deterrent
- **Adequate and dependable fuel supply**: 4 Major, 2 Minor, 1 Not a deterrent
- **Reliability**: 1 Major, 4 Minor, 2 Not a deterrent
- **Maintenance issues**: 2 Major, 1 Minor, 4 Not a deterrent
- **Infrastructure cost**: 2 Major, 3 Minor, 2 Not a deterrent
- **Fuel mileage**: 2 Major, 4 Minor, 1 Not a deterrent
- **Fuel cost**: 2 Major, 3 Minor, 2 Not a deterrent

Legend:
- **Major deterrent**
- **Minor deterrent**
- **Not a deterrent**
Reported Problems with E85

Adequate/dependable fuel supply

- Major problem: 1
- Minor problem: 4
- No greater problem: 1

Overall performance

- Minor problem: 4
- No greater problem: 2

Reliability

- Minor problem: 3
- No greater problem: 3

Maintenance

- Minor problem: 3
- No greater problem: 3

Fuel cost

- Major problem: 1
- Minor problem: 3
- No greater problem: 2

Legend:
- Major problem
- Minor problem
- No greater problem
### Deterrents for Agencies with Flex Fuel Vehicles that do not use E85

<table>
<thead>
<tr>
<th>Deterrent</th>
<th>0%</th>
<th>20%</th>
<th>40%</th>
<th>60%</th>
<th>80%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of information about E85</td>
<td>5</td>
<td>7</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Vehicle availability</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel quality</td>
<td>6</td>
<td>3</td>
<td>5</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adequate/dependable fuel supply</td>
<td>6</td>
<td>11</td>
<td>6</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Overall performance</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
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<tr>
<td>Reliability</td>
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<td>5</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
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<tr>
<td>Maintenance</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infrastructure cost</td>
<td>8</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel mileage</td>
<td>7</td>
<td>3</td>
<td>5</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel cost</td>
<td>6</td>
<td>3</td>
<td>7</td>
<td>5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Major deterrent**
- **Minor deterrent**
- **Not a deterrent**
- **Don't know**
### Reasons for Adopting Propane Given by Agencies that Use the Fuel

<table>
<thead>
<tr>
<th>Reason</th>
<th>Major reason</th>
<th>Minor reason</th>
<th>Not a reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance cost savings</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Fuel cost savings</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Positive performance impacts of...</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Improving public perception</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Political directives</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Desire to utilize local resources...</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Energy dependency concerns</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Reducing emissions</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**Legend:**
- **Major reason**
- **Minor reason**
- **Not a reason**
Problems Reported with Using Propane

- Vehicle performance
- Lack of technical/mechanical issues
- Reliability
- Maintenance issues
- Limited vehicle range
- Safety hazards
- Dependable and secure fuel supply
- Fuel cost

- Major problem
- Minor problem
- No greater problem
Deterrents from Adopting Propane by Agencies that Do Not Use Propane

- Lack of information about propane vehicles: 31% Major, 19% Minor, 31% Not a deterrent, 19% Don't know
- Vehicle performance: 23% Major, 21% Minor, 20% Not a deterrent, 36% Don't know
- Lack of technical/mechanical expertise for maintenance issues: 61% Major, 14% Minor, 10% Not a deterrent, 15% Don't know
- Reliability: 33% Major, 23% Minor, 16% Not a deterrent, 29% Don't know
- Maintenance issues: 45% Major, 19% Minor, 13% Not a deterrent, 24% Don't know
- Limited vehicle range: 43% Major, 24% Minor, 9% Not a deterrent, 25% Don't know
- Safety hazards: 38% Major, 25% Minor, 15% Not a deterrent, 23% Don't know
- Adequate and dependable fuel supply: 49% Major, 14% Minor, 18% Not a deterrent, 19% Don't know
- Modifications to maintenance facility: 72% Major, 10% Minor, 8% Not a deterrent, 10% Don't know
- Development and implementation of new fuel: 73% Major, 9% Minor, 5% Not a deterrent, 14% Don't know
- Fuel cost: 30% Major, 14% Minor, 23% Not a deterrent, 33% Don't know
- Vehicle availability: 42% Major, 24% Minor, 15% Not a deterrent, 19% Don't know
- High capital cost of the vehicles: 64% Major, 15% Minor, 3% Not a deterrent, 18% Don't know

Key:
- Major deterrent
- Minor deterrent
- Not a deterrent
- Don't know
Reasons Given for Adopting CNG

- **Fuel cost savings**: 5 major, 5 minor
- **Positive performance impacts of the fuel**: 4 major, 5 minor
- **Improving public perception**: 6 major, 3 minor, 1 not a reason
- **Political directives**: 3 major, 2 minor, 4 not a reason
- **Desire to utilize local resources and products**: 3 major, 5 minor, 1 not a reason
- **Energy dependency concerns**: 4 major, 6 minor
- **Reducing emissions**: 8 major, 1 minor, 1 not a reason

Legend:
- Major reason
- Minor reason
- Not a reason
Problems Reported with CNG Vehicles

- Vehicle performance: 5 major, 5 minor, 0 no greater problem
- Reliability: 1 major, 3 minor, 6 no greater problem
- Maintenance issues: 5 major, 5 minor, 0 no greater problem
- Limited vehicle range: 2 major, 5 minor, 3 no greater problem
- Safety hazards: 2 major, 8 minor, 0 no greater problem
- Dependable/secure fuel supply: 1 major, 3 minor, 6 no greater problem
- Fuel cost: 1 major, 9 minor, 0 no greater problem
Deterrents for Adopting CNG by Agencies Not Using CNG

<table>
<thead>
<tr>
<th>Deterrent</th>
<th>Major Deterrent</th>
<th>Minor Deterrent</th>
<th>Not a Deterrent</th>
<th>Don't Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of information about natural gas vehicles</td>
<td>19</td>
<td>17</td>
<td>23</td>
<td>17</td>
</tr>
<tr>
<td>Vehicle performance</td>
<td>20</td>
<td>19</td>
<td>14</td>
<td>25</td>
</tr>
<tr>
<td>Reliability</td>
<td>20</td>
<td>19</td>
<td>12</td>
<td>27</td>
</tr>
<tr>
<td>Maintenance issues</td>
<td>37</td>
<td>12</td>
<td>8</td>
<td>21</td>
</tr>
<tr>
<td>Limited vehicle range</td>
<td>28</td>
<td>23</td>
<td>8</td>
<td>19</td>
</tr>
<tr>
<td>Safety hazards</td>
<td>29</td>
<td>14</td>
<td>14</td>
<td>20</td>
</tr>
<tr>
<td>Adequate and dependable fuel supply</td>
<td>37</td>
<td>9</td>
<td>13</td>
<td>18</td>
</tr>
<tr>
<td>Modifications to maintenance facility</td>
<td>58</td>
<td></td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Development and implementation of new fuel</td>
<td>60</td>
<td></td>
<td>22</td>
<td>12</td>
</tr>
<tr>
<td>Fuel cost</td>
<td>21</td>
<td>10</td>
<td>21</td>
<td>26</td>
</tr>
<tr>
<td>Vehicle availability</td>
<td>28</td>
<td>16</td>
<td>15</td>
<td>19</td>
</tr>
<tr>
<td>High capital cost of the vehicles</td>
<td>47</td>
<td>12</td>
<td>3</td>
<td>16</td>
</tr>
</tbody>
</table>

Legend:
- Green: Major deterrent
- Brown: Minor deterrent
- Blue: Not a deterrent
- Purple: Don't know
Reasons Given for Adopting Hybrids

- **Fuel cost savings**
  - Major reason: 19
  - Minor reason: 5

- **Improving public perception**
  - Major reason: 16
  - Minor reason: 6
  - Not a reason: 1

- **Political directives**
  - Major reason: 10
  - Minor reason: 9
  - Not a reason: 4

- **Energy dependency concerns**
  - Major reason: 11
  - Minor reason: 10
  - Not a reason: 1

- **Reducing emissions**
  - Major reason: 16
  - Minor reason: 8
Deterrents for Hybrid Vehicles Considered by Agencies that Use Hybrids

- Lack of information about hybrids: 18 (Major deterrent), 10 (Minor deterrent), 2 (Not a deterrent)
- Vehicle performance: 12 (Major deterrent), 7 (Minor deterrent), 4 (Not a deterrent)
- Reliability: 14 (Major deterrent), 9 (Minor deterrent), 5 (Not a deterrent)
- Maintenance issues: 8 (Major deterrent), 9 (Minor deterrent), 7 (Not a deterrent)
- Cost to replace battery: 9 (Major deterrent), 8 (Minor deterrent), 6 (Not a deterrent)
- Depot modification costs: 15 (Major deterrent), 16 (Minor deterrent), 1 (Not a deterrent)
- Vehicle availability: 10 (Major deterrent), 16 (Minor deterrent), 7 (Not a deterrent)
- High capital cost of the vehicle: 10 (Major deterrent), 13 (Minor deterrent), 1 (Not a deterrent)
Problems Reported with Hybrids

- **Vehicle performance**
  - Major problem: 3
  - Minor problem: 6
  - No greater problem: 15

- **Reliability**
  - Major problem: 3
  - Minor problem: 2
  - No greater problem: 19

- **Maintenance**
  - Major problem: 3
  - Minor problem: 4
  - No greater problem: 17
Deterrents for Adopting Hybrid Vehicles by Agencies that Do Not Use Hybrids

<table>
<thead>
<tr>
<th>Deterrent</th>
<th>Major Deterrent</th>
<th>Minor Deterrent</th>
<th>Not a Deterrent</th>
<th>Don't Know</th>
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<tbody>
<tr>
<td>Lack of information</td>
<td>22</td>
<td>13</td>
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<tr>
<td>Vehicle performance</td>
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<td>Reliability concerns</td>
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<td>Costs to replace battery</td>
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<td>1</td>
<td>14</td>
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<td>Depot modification costs</td>
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<td>12</td>
<td>13</td>
<td>9</td>
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<tr>
<td>Vehicle availability</td>
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<tr>
<td>High capital cost of the vehicle</td>
<td>53</td>
<td>8</td>
<td>2</td>
<td>5</td>
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</tbody>
</table>

0%  20%  40%  60%  80%  100%

- Major deterrent
- Minor deterrent
- Not a deterrent
- Don't know
Major Findings

• Reducing emissions most important for hybrid or CNG adopters
• Energy dependency concerns, improving public perception, and fuel cost savings more important reason for hybrid adoption than biodiesel
• Fuel cost was found to most likely be a deterrent for biodiesel. Many agencies did not know if fuel cost would be a problem for the alternative fuels.
• Fuel mileage was often considered a major deterrent for E85, and some agencies also considered it a major deterrent for biodiesel.
• For agencies that did not use biodiesel, infrastructure cost was commonly mentioned as a major deterrent.
Major Findings

- Concern with maintenance issues was major deterrent. Some agencies were also concerned about fuel quality for biodiesel.
- Lack of an adequate and dependable fuel supply was a major deterrent for all alternative fuels. This was listed as a major deterrent for about half of E85, propane, and natural gas non-users and two-thirds of biodiesel non-users.
- Lack of information was considered a major deterrent for about one fourth to one third of agencies.
- Overall performance was most likely to be considered a deterrent for hybrid vehicles.
- Vehicle availability was a major deterrent for 45% of agencies for hybrids and 42% of agencies for propane vehicles. It was considered less of a deterrent for E85 and was not a deterrent for biodiesel use.
Major Findings

• Vehicle cost was the greatest deterrent for use of hybrids and also one of the most significant deterrents for propane and natural gas use.

• Development and implementation of new fuel infrastructure and modifications to maintenance facilities were the greatest deterrents for use of propane and natural gas.

• Safety hazards and limited vehicle range are also considered major deterrents by a significant number of agencies for adopting propane or natural gas.
Differences Between Users and Non-Users

- Larger agencies and those in urban areas more likely to adopt (with the exception of E85 and propane)
- Users are more likely than non-users to identify benefits
  - 71% of biodiesel users thought improving public perception was a major benefit, compared to just 31% of non-users
- Non-users more likely than users to identify deterrents
  - Deterrents may be real or perceived
Differences Between Urban and Rural Transit Providers

- Rural operators were less likely than urban operators to be “very satisfied” with hybrids or CNG.
- Adequate and dependable fuel supply and limited vehicle range was a greater deterrent for rural operators.
- Rural operators were less likely than urban operators to identify benefits from using hybrids, CNG, or propane.
- Some rural respondents indicated there would be no or little benefit in using a hybrid vehicle in rural areas.
Factors Affecting Adoption

- Agency characteristics
- Perceived benefits
- Perceived deterrent
### Results from Binary Logit Model of Adoption

<table>
<thead>
<tr>
<th></th>
<th>Biodiesel</th>
<th>Hybrids</th>
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<tbody>
<tr>
<td><strong>Variables</strong></td>
<td><strong>Odds Ratio</strong></td>
<td><strong>Odds Ratio</strong></td>
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<td>Vehicles (number)</td>
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<tr>
<td>Vehicle miles (thousand)</td>
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<td>Vehicle hours (thousand)</td>
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<td>Urban</td>
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<td>Emissions</td>
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<td>Public perception</td>
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<td>Cost savings</td>
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<td><strong>Deterrents</strong></td>
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<td>Fuel cost</td>
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<td>Infrastructure cost/Depot modification cost</td>
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<td>Fuel supply</td>
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<td>Vehicle cost</td>
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<td>0.635</td>
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</table>

*n=86*  

*p < .10 **p < .05 ***p < .01*
Factors Affecting Satisfaction with Biodiesel

- Agency characteristics
  - Size, urban/rural
- Number of years using biodiesel
- Provision of training
- Change blend in winter months
- Percentage of fleet that uses biodiesel
Results from Ordered Logit Model of Biodiesel Satisfaction

<table>
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<tr>
<th>Feature</th>
<th>Odds Ratio</th>
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<tbody>
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<td>Vehicle hours (thousand)</td>
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<tr>
<td>Urban</td>
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<td>Years of experience</td>
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<td>Training</td>
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<td>Change blend</td>
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<td>Percentage of fleet</td>
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n=20

*p < .10  **p < .05  ***p < .01
Conclusions

• Larger, urban agencies more likely to adopt
• Beliefs about benefits and deterrents influence adoption
  • Beliefs about benefits of emissions reductions, improved public perception, and cost savings are motivating factors
  • Concerns about infrastructure costs and fuel supply influence decision to adopt
• Transit agencies generally satisfied with alternative fuels and hybrids, though some have reported problems
• Experiences of users can differ from the expectations or perceptions of non-users
THANK YOU

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