Non-fiscal measures to improve fuel economy

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GFEI Vehicle Fuel Economy Policy Training
Overview

- About ICCT
- Background information
- How to develop fuel economy standards?
- How to develop fuel economy labeling schemes?
- Panel discussion/questions
What is ICCT?

- ICCT is an independent non-profit research organization that provides technical support on transport efficiency and emission policies in major auto markets.
What to Know about Fuel Economy Regulation

- Policy options
- Metric
- Technologies
- Consumer attitude
## Policy options

<table>
<thead>
<tr>
<th>Policy Options</th>
<th>Measures</th>
</tr>
</thead>
</table>
| **VEHICLE FUEL EFFICIENCY STANDARDS** | • Introduce and regularly strengthen mandatory standards  
• Establish and harmonize testing procedures for fuel efficiency measurement. |
| **FISCAL MEASURES** | • Fuel taxes and vehicle taxes to encourage the purchase of more fuel-efficient vehicles.  
• Infrastructure support and incentive schemes for very fuel-efficient vehicles. |
| **MARKET-BASED APPROACHES** | • Voluntary programs such as U.S. SmartWay and other green freight programs |
| **INFORMATION MEASURES** | • Vehicle fuel economy labels  
• Improving vehicle operational efficiency through eco-driving and other measures. |
Performance standards, economic signals, and technological innovation complement each other.
Regulatory metric

- **Fuel economy** (mile/gallon, km/L)
  - Used in U.S., Japan

- **Fuel consumption** (L/100km, gal/mi)
  - Used in China, Australia
  - The inverse of fuel economy

- **Carbon dioxide** (CO₂/mile, CO₂/km)
  - Used in EU
  - Require simple conversion with fuel-carbon contents
  - Gasoline (~2350 gCO₂/liter); Diesel (~2700 gCO₂/liter)

- **Greenhouse gas** (CO₂e/mile, CO₂e/km)
  - Used in U.S., Canada
  - Can include other non-CO₂ emissions (e.g., CH₄, N₂O, HFC, black carbon)
How to improve vehicle fuel economy?

- The average 2010 car, at 15-20% efficiency, has many efficiency losses – and many efficiency opportunities.

<table>
<thead>
<tr>
<th>Loss Category</th>
<th>Improvement Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine</td>
<td>Variable valve timing, Low friction lubrication, Cylinder deactivation</td>
</tr>
<tr>
<td>Accessories</td>
<td>Direct injection, Turbocharging, Compression ignition</td>
</tr>
<tr>
<td>Idling</td>
<td>Lean-burn, Electric power steering, Efficient air conditioning</td>
</tr>
<tr>
<td>Transmission</td>
<td>6-8 speed transmission, Dual-clutch transmission, Integrated starter “Stop-start”</td>
</tr>
<tr>
<td>Inertial acceleration</td>
<td>Low drag brakes, Improved aerodynamics</td>
</tr>
<tr>
<td>Road</td>
<td>Low rolling resistance tires</td>
</tr>
<tr>
<td>Braking</td>
<td></td>
</tr>
<tr>
<td>Aerodynamic drag</td>
<td></td>
</tr>
<tr>
<td>Rolling resistance</td>
<td></td>
</tr>
</tbody>
</table>
What’s consumer attitude?

- Consumers in the US
  - 85% concerned about gas prices; 79% concerned about mid-east oil dependence
  - 81% general support of fuel economy standards; 64% support 60 mpg standard
- Cost and payback
  - Technology cost of $1500-2500/vehicle; Fuel savings of $500-1000/year;
  - Consumer payback in 2-4 years; all scenarios offer benefits >3 times initial costs

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Technology Case in 2025</th>
<th>Per-vehicle price increase ($/vehicle)</th>
<th>Average payback period (yr)</th>
<th>Net lifetime owner savings ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>51 mpg 173 gCO₂/mi 4%/year</td>
<td>Path A</td>
<td>1,700</td>
<td>2.5</td>
<td>5,900</td>
</tr>
<tr>
<td></td>
<td>Path B</td>
<td>1,500</td>
<td>2.2</td>
<td>6,000</td>
</tr>
<tr>
<td></td>
<td>Path C</td>
<td>1,400</td>
<td>1.9</td>
<td>6,200</td>
</tr>
<tr>
<td></td>
<td>Path D</td>
<td>1,900</td>
<td>2.9</td>
<td>5,300</td>
</tr>
<tr>
<td>56 mpg 158 gCO₂/mi 5%/year</td>
<td>Path A</td>
<td>2,500</td>
<td>3.1</td>
<td>6,500</td>
</tr>
<tr>
<td></td>
<td>Path B</td>
<td>2,300</td>
<td>2.8</td>
<td>6,700</td>
</tr>
<tr>
<td></td>
<td>Path C</td>
<td>2,100</td>
<td>2.5</td>
<td>7,000</td>
</tr>
<tr>
<td></td>
<td>Path D</td>
<td>2,600</td>
<td>3.6</td>
<td>5,500</td>
</tr>
</tbody>
</table>

Scenario labels are based on regulatory two-cycle fuel economy and CO₂ (various credits, like for air-conditioning technology are available)
How to develop fuel economy standard?

• Why important
• Key elements
The importance of mandatory standards

**CO₂ performance standards in the European Union**

*New passenger cars 1995-2013*

- Automotive industry self commitment adopted
- CO₂ monitoring system established
- Review of European Commission strategy, decision to introduce regulatory measures
- Formal adoption of CO₂ performance standards regulation

**EU-27 new passenger cars CO₂ [in g/km]**
- 2015 target: 130 g/km (ca. 5.1 l/100km)
- 2020 target: 95 g/km (ca. 3.7 l/100km)

**Annual reduction rate**

Data sources: 1995-1999 ACEA data for EU-15; 2000-2013 EU CO₂ monitoring data (2000-2003 EU-15, 2004-2006 EU-25, 2007-2013 EU-27). Note that changes in the number of member states (from 15 to 27) have only minor effects on the overall emission level (about 0.5 g CO₂/km) as passenger car sales numbers in the new member states are relatively low.
# Fuel economy standards around the world

## Table 1. Comparison of the latest adopted regulations for light- and heavy-duty efficiency in selected regions

<table>
<thead>
<tr>
<th>Region</th>
<th>Percent of world vehicle sales, 2013</th>
<th>Baseline model year</th>
<th>Implementation period (model year)</th>
<th>Reduction in average CO₂ rate (grams/vehicle-km)</th>
<th>Baseline model year</th>
<th>Implementation period (model year)</th>
<th>Reduction in average CO₂ rate (grams/vehicle-km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU</td>
<td>19%</td>
<td>2015</td>
<td>2020-2021</td>
<td>27%</td>
<td>2011</td>
<td>2014-2018</td>
<td>14%</td>
</tr>
<tr>
<td>US</td>
<td>17%</td>
<td>2017</td>
<td>2017-2025</td>
<td>35%</td>
<td>2011</td>
<td>2014-2018</td>
<td>14%</td>
</tr>
<tr>
<td>Japan</td>
<td>6%</td>
<td>2015</td>
<td>2020</td>
<td>16%</td>
<td>2006</td>
<td>2015</td>
<td>12%</td>
</tr>
<tr>
<td>Brazil⁶</td>
<td>4%</td>
<td>2013</td>
<td>2013-2017</td>
<td>12%</td>
<td>2011</td>
<td>2014-2018</td>
<td>0%</td>
</tr>
<tr>
<td>India</td>
<td>4%</td>
<td>2012</td>
<td>2017-2021</td>
<td>17%</td>
<td>2011</td>
<td>2014-2018</td>
<td>0%</td>
</tr>
<tr>
<td>Russia</td>
<td>3%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada⁤</td>
<td>2%</td>
<td>2011</td>
<td>2011-2016</td>
<td>20%</td>
<td>2011</td>
<td>2014-2018</td>
<td>14%</td>
</tr>
<tr>
<td>South Korea</td>
<td>2%</td>
<td>2011</td>
<td>2012-2015</td>
<td>9%</td>
<td>2011</td>
<td>2014-2018</td>
<td>0%</td>
</tr>
<tr>
<td>Australia</td>
<td>1%</td>
<td>2011</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>1%</td>
<td>2012</td>
<td>2014-2016</td>
<td>13%</td>
<td>2011</td>
<td>2014-2018</td>
<td>0%</td>
</tr>
</tbody>
</table>

* Adopted or newly implemented between Jan. 2013 and Aug. 2014
* Adopted or implemented prior to Jan. 2013

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* Includes eleven major vehicle markets
* Percent reduction in new fleet fuel consumption estimated from a baseline year (determined by expert judgment rather than regulatory requirement) to the final model year covered by the regulation. Reductions for HDVs are activity-weighted by vehicle type.
* China has adopted separate standards for passenger cars and light commercial vehicles. The latest adopted standard for passenger cars (Phase 3) is summarized here.
* Brazil’s Inovar-Auto program requires a 12.1% improvement for manufacturers to qualify for a 30% reduction in vehicle sales tax.
* Canada has announced intention to harmonize with the US 2017-2025 GHG standards; however, formal adoption has not occurred as of August 2014.
Challenges for HDV fuel economy standards
Key elements to consider when introducing fuel economy standards

1. Regulated metric
   (fuel consumption, GHG, CO₂…)

2. Form of target curve + underlying attribute
   (flat, steps, continuous, … weight, footprint, …)

3. Target timeframe/limit value
   (level of ambition: baseline analysis, technology feasibility, cost and benefit)
# 1. Regulated metric

<table>
<thead>
<tr>
<th>Country or Region</th>
<th>Target Year</th>
<th>Regulated metric</th>
<th>Unadjusted Fleet Target/Measure</th>
<th>Form of target curve</th>
<th>Test Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU</td>
<td>2015-2021</td>
<td>CO₂</td>
<td>130 gCO₂/km 95 gCO₂/km</td>
<td>Weight-based</td>
<td>NEDC</td>
</tr>
<tr>
<td>China</td>
<td>2015-2020</td>
<td>Fuel consumption</td>
<td>6.9 L/100km 5 L/100km</td>
<td>Weight-class based</td>
<td>NEDC</td>
</tr>
<tr>
<td>U.S.</td>
<td>2016-2025</td>
<td>Fuel economy/GHG</td>
<td>36.2 mpg or 225 gCO₂/mi 56.2 mpg or 143 gCO₂/mi</td>
<td>Footprint-based</td>
<td>U.S. combined</td>
</tr>
<tr>
<td>Canada</td>
<td>2016-2025</td>
<td>GHG</td>
<td>217 gCO₂/mi N/A</td>
<td>Footprint-based</td>
<td>U.S. combined</td>
</tr>
<tr>
<td>Japan</td>
<td>2015-2020</td>
<td>Fuel economy</td>
<td>16.8 km/L 20.3 km/L</td>
<td>Weight-class based</td>
<td>JC08</td>
</tr>
<tr>
<td>Brazil</td>
<td>2017</td>
<td>Fuel consumption</td>
<td>1.82 MJ/km</td>
<td>Weight-based</td>
<td>U.S. combined</td>
</tr>
<tr>
<td>India</td>
<td>2017-2022</td>
<td>CO₂</td>
<td>130 g/km 113 g/km</td>
<td>Weight-based</td>
<td>NEDC for low-powered vehicle</td>
</tr>
<tr>
<td>South Korea</td>
<td>2015-2020</td>
<td>Fuel economy/GHG</td>
<td>17 km/L or 140 gCO₂/km 24 km/L or 97 gCO₂/km</td>
<td>Weight-based</td>
<td>U.S. combined</td>
</tr>
<tr>
<td>Mexico</td>
<td>2016</td>
<td>Fuel economy/GHG</td>
<td>39.3 mpg or 140 g/km</td>
<td>Footprint-based</td>
<td>U.S. combined</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>2020</td>
<td>Fuel economy</td>
<td>17 km/L</td>
<td>Footprint-based</td>
<td>U.S. combined</td>
</tr>
</tbody>
</table>
## 2. Form of target curve and based attribute

<table>
<thead>
<tr>
<th>Country/ Region</th>
<th>Attribute</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Weight</td>
<td>Footprint</td>
</tr>
<tr>
<td>European Union#</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Japan</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>South Korea*</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>India</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
US fuel economy standard curves
China standard curves

- Phase 1 Max (2005)
- Phase 2 Max (2008)
- Phase 3 CAFC (2015)/Phase 4 Max
- Phase 4 CAFC proposed (2020)
Weight-based system strongly reduces weight reduction incentive; not technology neutral

Weight-based target system

Footprint-based target system

If manufacturer applies weight reduction, most of the CO₂-reduction effect is taken away from him due to now more stringent CO₂ target.

Manufacturer fully benefits from the CO₂-reduction effect of lightweighting.
3. Target time frame/stringency

- US 2025: 56.2
- Canada 2025: 56.2
- Mexico 2016: 35.1
- EU 2021: 56.9
- Japan 2020: 45.9
- China 2020: 47.7
- S. Korea 2020: 56.7
- India 2022: 20.8
- Brazil 2017: 40.9
- KSA 2020: 40.0

Miles per gallon (gasoline equivalent), normalized to CAFE

- historical performance
- enacted targets
- proposed targets or targets under study

Kilometers per liter (gasoline equivalent)
Baseline analysis

- Basic specifications: engine size, curb weight, footprint…
- Utility: power, max speed…
- Fuel consumption, CO₂ emissions…
- Technology adoption: fuel type, transmission, air intake…

### China 2010 passenger car data

<table>
<thead>
<tr>
<th>Segment</th>
<th>Mini</th>
<th>Small</th>
<th>Lower medium</th>
<th>Medium</th>
<th>Large</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market share</td>
<td>6%</td>
<td>15%</td>
<td>32%</td>
<td>10%</td>
<td>4%</td>
</tr>
<tr>
<td>Representative model</td>
<td>Chery QQ3</td>
<td>BYD F3</td>
<td>Hyundai Elantra</td>
<td>Honda Accord</td>
<td>Audi A6</td>
</tr>
<tr>
<td>Diesel share</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>Cylinder</td>
<td>3.5</td>
<td>3.9</td>
<td>4.0</td>
<td>4.1</td>
<td>5.0</td>
</tr>
<tr>
<td>Displacement [L]</td>
<td>1.1</td>
<td>1.4</td>
<td>1.6</td>
<td>2.0</td>
<td>2.4</td>
</tr>
<tr>
<td>Power [kW]</td>
<td>50</td>
<td>71</td>
<td>84</td>
<td>112</td>
<td>141</td>
</tr>
<tr>
<td>Auto. transmission share</td>
<td>17%</td>
<td>26%</td>
<td>44%</td>
<td>67%</td>
<td>89%</td>
</tr>
<tr>
<td>Curb weight [kg]</td>
<td>918</td>
<td>1080</td>
<td>1258</td>
<td>1464</td>
<td>1684</td>
</tr>
<tr>
<td>CO₂ [g/km] (NEDC)</td>
<td>150</td>
<td>157</td>
<td>173</td>
<td>199</td>
<td>211</td>
</tr>
</tbody>
</table>
# Technology feasibility

- Top runner (e.g. Japan)
  - Best available technology
- Technology forcing
  - Emerging off-the-shelf technology now; advanced technology later

## US mid-size vehicle

<table>
<thead>
<tr>
<th>Technology</th>
<th>CO₂ emission rate (g CO₂e/mile)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline mid-size car (3.3L V6 DOHC, 4-speed)</td>
<td>27 mpg</td>
</tr>
<tr>
<td>Turbo-GDI, DCP, DCT, 3% mass, aero, tire, etc</td>
<td>38 mpg</td>
</tr>
<tr>
<td>Turbo-GDI, DCP, DCT, stop-start, 15% mass, etc</td>
<td>43 mpg</td>
</tr>
<tr>
<td>Turbo-GDI, DCP, EGR, DCT, stop-start, 15% mass, etc</td>
<td>45 mpg</td>
</tr>
<tr>
<td>Turbo-GDI, DCP, EGR, DCT, stop-start, 25% mass, etc</td>
<td>50 mpg</td>
</tr>
<tr>
<td>Hybrid, DCP, DCT, 20% mass, etc</td>
<td>52 mpg</td>
</tr>
<tr>
<td>Hybrid, turbo-GDI, DCP, DCT, 20% mass, etc</td>
<td>62 mpg</td>
</tr>
<tr>
<td>Hybrid, turbo-GDI, DCP, EGR, DCT, 20% mass, etc</td>
<td>68 mpg</td>
</tr>
<tr>
<td>Plug-in hybrid, US grid (40-mile equiv)</td>
<td></td>
</tr>
<tr>
<td>Electric vehicle, US grid</td>
<td></td>
</tr>
<tr>
<td>Plug-in hybrid, low-GHG grid (40-mile equiv)</td>
<td></td>
</tr>
<tr>
<td>Electric vehicle, low-GHG grid</td>
<td></td>
</tr>
</tbody>
</table>

Emission rates are test-cycle (not adjusted real world);
Cost curve

EU cost curve
C class vehicle

<table>
<thead>
<tr>
<th>Model</th>
<th>Engine</th>
<th>Trans</th>
<th>Mass</th>
<th>CO₂</th>
<th>Fuel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline, M5</td>
<td>1.6l</td>
<td>8DCT</td>
<td>156</td>
<td>95 g/km</td>
<td>5.6 l</td>
</tr>
<tr>
<td>SS, 1.6l, M5</td>
<td>5.6 l</td>
<td>8DCT</td>
<td>-10%</td>
<td>80 g/km</td>
<td>3.3 l</td>
</tr>
<tr>
<td>SS+SGTDI, 0.8l</td>
<td>8DCT</td>
<td>97 g/km</td>
<td>-20%</td>
<td>70 g/km</td>
<td>2.9 l</td>
</tr>
</tbody>
</table>

Baseline, 1.6l, M5, 136 g/km, 5.6 l
SS, 1.6l, M5, 136 g/km, 5.6 l
SS+SGTDI, 0.8l, 8DCT, 97 g/km, 4.0 l
P2 AtkCPS, 1.2l, 8DCT, 77 g/km, 3.1 l
P2 AtkCPS, 1.6l, 8DCT, 58 g/km, 2.7 l
P2 AtkCPS, 1.9l, 8DCT, 3.1 l
55% CEGR, 0.7l, 8DCT, 74 g/km, 3.0 l

EU cost curve
C class vehicle

<table>
<thead>
<tr>
<th>Year</th>
<th>CO₂ reduction</th>
<th>Fuel consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>95 g/km (3.9 l/100km)</td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>80 g/km (3.3 l/100km)</td>
<td></td>
</tr>
<tr>
<td>2025</td>
<td>70 g/km (2.9 l/100km)</td>
<td></td>
</tr>
</tbody>
</table>

-65% -55% -45% -35% -25% -15% -5%
-65% -55% -45% -35% -25% -15% -5%

Additional direct manufacturing costs [EUR] relative to 2010 baseline

0 1000 2000 3000 4000 5000

Corresponding fleet targets
Cost and benefit analysis

- **Net cost:**
  - Investment cost

- **Net benefit:**
  - Lifetime fuel cost saving
  - Environmental benefit (climate change)
  - Oil security

\[
\text{CO}_2\text{-abatement costs} = \frac{\text{investment} - \text{NPV (lifetime fuel cost savings)}}{\text{lifetime CO}_2\text{-reduction}}
\]

- \(\text{CO}_2\) abatement of 2015 EU regulation evaluation is - 101 EUR/tCO₂
Regulation evaluation: estimates vs. reality

2015 EU regulation assessment
Ex-ante: + 33 EUR/tCO₂
Ex-post: - 101 EUR/tCO₂
Take away on fuel economy standards

• Regulated metrics are interchangeable
• Establish continuous and footprint-based standard curve
• Set longer term target with 3-6% annual improvement
• Baseline analysis → technology feasibility → cost curve → cost and benefit analysis
• Fuel economy standards and fiscal measure complement with each other
How to develop fuel economy labeling scheme

• What is FE label
• What’s the impact
• Key elements
Implementation of vehicle fuel economy labeling scheme
Vehicle fuel economy labeling schemes

VFEL schemes include

- The “fuel economy label” referring information that is displayed about the car in the showroom, online or through other media
- Associated consumer information campaign
**Label can raise consumer awareness**

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td>29%</td>
<td>28%</td>
<td>33%</td>
<td>36%</td>
</tr>
<tr>
<td><strong>New car owners</strong></td>
<td>36%</td>
<td>37%</td>
<td>41%</td>
<td>49%</td>
</tr>
<tr>
<td><strong>New car intenders</strong></td>
<td>22%</td>
<td>21%</td>
<td>26%</td>
<td>29%</td>
</tr>
</tbody>
</table>

**UK: Consumers awareness of the fuel economy label, 2006-2009**


**New Zealand:**

*Those who rated fuel consumption as important*

Label is enabler for other policies

Vehicle fuel economy labels in Singapore

Fuel economy information to establish **fuel economy standards**

Fuel economy based **fiscal policy**
Label can contribute to fuel saving

- Estimated Savings Attributable to the VFEL Program in New Zealand

<table>
<thead>
<tr>
<th>Year</th>
<th>Estimated savings achieved in the one year. (million litres)</th>
<th>Estimated cumulative savings achieved by the programme (million litres)</th>
<th>Estimated carbon emission savings achieved in the one year (kT CO₂)</th>
<th>Estimated financial savings achieved in the one year ($ million)</th>
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<td>13.37</td>
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<td>20.02</td>
<td>3.6</td>
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<td>1.32</td>
<td>28.00</td>
<td>3.2</td>
<td>2.6</td>
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</table>

Source: Hamish Trolove, Christine Patterson, 2013 Review of the Vehicle Fuel Economy Labelling (VFEL) Programme
Key elements to consider when introducing fuel economy label

1. Scope
   (Mandatory/voluntary, LDV/HDV, new/used, fuel type…)

2. Label design/information display
   (Fuel economy/CO₂ value, absolute/rating, fiscal/running cost, others)

3. Consumer outreach
   (Dedicated website, label on the car/online/other media…)
Labeling program scope

Economies with * apply VFEL program to vehicles with all fuel types;
Economies in red apply VFEL program to passenger cars only;
Others apply to passenger cars and light truck/light-commercial vehicles.
Label design/information

**US label**
- Absolute fuel economy value
- Fuel economy/GHG rating
- Annual fuel cost saving

**Singapore label**
- Absolute fuel economy value
- Fuel economy/GHG range
- Fiscal policy information

Vehicle fuel economy labels in Chile

Vehicle fuel economy labels in Singapore
Label information for alternative fuel vehicles

Special considerations for AFVs

- Fuel efficiency/consumption equivalent (MPGe?)
- CO₂ emissions (Inclusion of upstream emissions?)
- Refueling cost
- Financial information
- Others (Electricity consumption, range, charge time, operation information of AFVs)

Label in the UK
Consumer outreach

How far can each vehicle travel on $100 of fuel?*

**BMW 3 SERIES 320D**
- ENGINE: 1995cc 120kW
- FUEL: diesel
- TRANS: automatic
- SEATS: 5 seats
- YEAR: 2012- (current)
- 1550km
- 4.4 litres per 100km
- $1720

**VOLKSWAGEN GOLF TDI COMFORTLINE**
- ENGINE: 1598cc 77kW
- FUEL: diesel
- TRANS: automatic
- SEATS: 5 seats
- YEAR: 2013- (current)
- 1740km
- 3.9 litres per 100km
- $1610

**TOYOTA PRIUS**
- ENGINE: 1798cc 73kW
- FUEL: petrol (hybrid)
- TRANS: CVT
- SEATS: 5 seats
- YEAR: 2009-2014
- 1050km
- 3.9 litres per 100km
- $1340

*How far a vehicle travels on $100 of fuel is based on $2.45 per litre of petrol and $1.47 per litre of diesel. It does not include Road User Charges.

**Average yearly running costs based on 14,000km, $2.45 per litre for petrol and $1.47 for diesel and includes Road User Charges for diesel vehicles.

Source: New Zealand energywise website
Find what consumers like

- Understand car-purchase behavior
- Consumer attitudes on what constitutes as effective information changes over time
- Characteristic of different methods of collecting consumer information

<table>
<thead>
<tr>
<th>Method</th>
<th>Comprehensiveness</th>
<th>Depth of insight</th>
<th>Representativeness</th>
<th>Accuracy</th>
<th>Speed</th>
<th>Cost effectiveness</th>
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<td>Medium</td>
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<td>Fast</td>
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<td>Focus groups</td>
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<td>Expert panel</td>
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<td>Low</td>
<td>Medium</td>
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</tbody>
</table>
Rising concern: real world emissions diverging from standards

http://www.theicct.org/laboratory-road-2014-update
Take away on fuel economy labeling

• Mandatory requirement with wide scope (LDV/HDV, new/used, all fuel type)
• Label information (Fuel economy absolute value/rating, fuel cost/financial information, AFVs)
• Information online and through other media
• Market-base research
• Make sure test fuel economy represents real fuel economy
• Labeling program collects data and is enabler for fuel economy standards and fiscal measures
Meeting GFEI target will stabilized global CO\textsubscript{2} emissions in 2020

Business as usual = vehicle efficiency remains at 2005 levels. Adopted = currently adopted policies. GFEI Target = countries adopt standards that reduce average fuel consumption of new vehicles to 50\% below 2005 levels by 2030 (GFEI, 2014).

Estimated using ICCT’s Global Transportation Roadmap model (Facanha, et al., 2012).
More information …

- ICCT Passenger Vehicles website: http://www.theicct.org/passenger-vehicles
- ICCT Staff blog: http://www.theicct.org/blogs/staff
- EU LDV CO₂ Regulation: http://www.theicct.org/policies/eu-light-duty-vehicle-co2-regulation
- Review and Comparative Analysis of Fiscal Policies to promote fuel economy: http://www.theicct.org/review-and-comparative-analysis-fiscal-policies
- CO₂ Standards: http://www.theicct.org/issues/co2-standards

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zifei.yangr@theicct.org
Backup slides
Light truck/light-commercial vehicle fuel economy standards globally

- **US**: 2020: 14.1
- **Canada**: 2025: 14.1
- **Mexico**: 2016: 14.1
- **Japan**: 2022: 13.5
- **China**: 2015: 14.7
- **KSA**: 2020: 16
- **S. Korea**: 2020: 16

**Graph Details**
- **Y-axis**: Grams CO₂ per kilometer, normalized to NEDC
- **X-axis**: Liters per 100 kilometers (gasoline equivalent)
- **Legend**:
  - historical performance
  - enacted targets
  - proposed targets or targets under study
### Cost and payback by countries

<table>
<thead>
<tr>
<th>Rule</th>
<th>Per-Vehicle Cost</th>
<th>Payback Period</th>
</tr>
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<tbody>
<tr>
<td>US LDV 2017–2025</td>
<td>$1,800 (avg. 2025)</td>
<td>3.5 years</td>
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<tr>
<td>US LDV 2012–2016</td>
<td>$950 (avg. 2016)</td>
<td>3 years</td>
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<tr>
<td>Canada LDV 2017-2025</td>
<td>$707 (2021); $2,095 (2025)</td>
<td>2 to 5 years</td>
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<td>Canada LDV 2011-2016</td>
<td>$89 (2011); $1,195 (2016)</td>
<td>1.5 years</td>
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<td>European 95g CO2/km</td>
<td>€1,300</td>
<td>4-5 years</td>
</tr>
<tr>
<td>Standard 2020</td>
<td></td>
<td></td>
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<tr>
<td>India LDV 2020</td>
<td>$478 to $637</td>
<td>2–3 years</td>
</tr>
</tbody>
</table>
What are Green Freight Programs

- **What is Green Freight?**
  - “Green freight” refers to a collection of technologies and practices that improve the efficiency of the freight sector

- **What are Green Freight programs?**
  - Green freight programs promote these technologies and practices across the freight sector to help cut costs and benefit the environment.

- **Currently there are approximately 15 established Green Freight programs worldwide**
  - Wide variations between program elements (including transport mode, regional/national coverage, administrative structure)

- **Key stakeholder groups**
  - Private Sector (shippers, carriers, logistics companies), Government, Technology Manufacturers, Financing Institutions, Civil Society
Green Freight Programs and Initiatives

Modal and regional programs

National programs

Other initiatives

Smart Freight Centre