Design of Fuel Economy/Greenhouse Gas (GHG) Standards
Learning from international experiences

<table>
<thead>
<tr>
<th>Country/Region</th>
<th>Regulated metric</th>
<th>Program details, reduction in CO₂-per-distance emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>European Union⁶</td>
<td>CO₂ emissions (CO₂/km)</td>
<td>40% reduction, MY 2008-2020 EU NEDC</td>
</tr>
<tr>
<td>United States</td>
<td>Fuel economy (mi/gal) GHG emissions (CO₂e/mi)</td>
<td>42% reduction, MY 2010-2025 U.S. FTP</td>
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<tr>
<td>Japan²</td>
<td>Fuel economy (km/L)</td>
<td>30% reduction, MY 2010-2020 Japan JC08</td>
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<tr>
<td>China²</td>
<td>Fuel consumption (L/100km)</td>
<td>14% reduction, MY 2008-2015 EU NEDC cycle</td>
</tr>
<tr>
<td>Canada</td>
<td>GHG emissions (CO₂e/mi)</td>
<td>24% reduction, MY 2009-2016 U.S. FTP</td>
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<tr>
<td>South Korea</td>
<td>Fuel economy (km/L) CO₂ emissions (CO₂/km)</td>
<td>12% reduction, MY 2012-2015 U.S. FTP</td>
</tr>
<tr>
<td>Mexico</td>
<td>Fuel economy (km/L)</td>
<td>12% reduction, MY 2011-2016 U.S. FTP</td>
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<tr>
<td>India</td>
<td>Fuel economy (km/L)</td>
<td>20% reduction, MY 2010-2020 NEDC for low powered vehicles</td>
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</tbody>
</table>

#: Separate standards established for light-commercial vehicles
Comparison of passenger vehicle GHG standards

[1] China’s target reflects gasoline vehicles only. The target may be lower after new energy vehicles are considered.

Comparison of Light-Commercial vehicle GHG standards

Characteristics of Worldwide Standards

<table>
<thead>
<tr>
<th>Country/Region</th>
<th>Regulated metric</th>
<th>Attribute</th>
<th>Form</th>
<th>Categories, classes, other provisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>European Union*</td>
<td>Fuel Economy</td>
<td>X</td>
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<tr>
<td>United States</td>
<td>Fuel Consumption</td>
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<tr>
<td>Japan</td>
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<td>X</td>
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<td>X</td>
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<tr>
<td>China</td>
<td>CO₂/GHG</td>
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<td>X</td>
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<tr>
<td>Canada</td>
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<td>South Korea*</td>
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<td>Mexico</td>
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<tr>
<td>India</td>
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</table>

* : CO₂ standards complemented by Air-conditioning, tyre pressure monitoring, gear-shift indicators etc.
* : FE/CO₂ standards include consideration for tyre pressure monitoring, gear-shift indicators
CO₂ performance standards in the European Union
New passenger cars 1995-2011

EU 27 new passenger cars CO₂ (in g/km)

1995: 165 (ca. 8.8 g CO₂/km)
1996: 163
1997: 161
1998: 172
1999: 177
2000: 179
2001: 167
2002: 166
2003: 163
2004: 162
2005: 159
2006: 154
2007: 146
2008: 140
2009: 135
2010: 125
2011: 115


EU 2015 and 2020 target curves

Mass of the Vehicle in Running Order (kg)

2015: T = 130 + 0.0333 * (M-1372)
2020: T = 95 + 0.0333 * (M-60)

Background: 2016 US Car and Truck Standards

- Separate CO\textsubscript{2}\,-indexed car and truck standards (with separate slopes)
  - By statute (EPCA 1975, EISA 2007), NHTSA must set separate attribute-based car, truck standards
  - Assuming no shifts in fleet composition and no trading → -24% gCO\textsubscript{2}e/mile from 2008-2016
  - Cars and trucks would reduce gCO\textsubscript{2}e/mile by 23% and 26%, respectively, from 2008 to 2016.
  - Excluding 10.6 gCO\textsubscript{2}/mile from AC credits, CO\textsubscript{2} reductions are 19% (cars) and 21% (truck)

The equivalent lines for CAFE standards are slightly sloped (i.e., not perfectly linear) in fuel economy (mpg) space; note that EPA assumes some sales shift toward smaller cars/trucks in 2016 timeframe in their analysis; in MY2012, 2WD SUVs shift from light truck to car category; the right y-axis is rated fuel economy after 10.6 g/mile AC credits are utilized.

2017 and 2025 US Cars and Light-Truck Standards

1 Sq. meter = 10.764 Sq. feet
Japan’s “front runner” weight-based fuel economy standards

Japan 2010, 2015 and 2020 Standards in JC08 km/L

China Phase III standards based on corporate averaging
Canada 2011-2016 standards harmonized with US

S. Korea has adopted dual FE and CO\textsubscript{2} standards for 2015, phase-in from 2012
Mexico plans to harmonize with US standards by 2016

India Proposed 2015-16 and 2020-21 standards. Manufacturers have asked to delay 2015-16 standards by one year.
Brazil 2017 INOVAR-AUTO Tax Incentive

2017 INOVAR-AUTO Target
MJ/km = 1.155 + 0.000593*M
~ 146 g/km CO2

1% additional tax reduction
MJ/km = 1.111 + 0.000570*M
~ 140 g/km CO2

2% additional tax reduction
MJ/km = 1.067 + 0.000547*M
~ 135 g/km CO2

Note: All CO2 values measured on FTP (City) cycle. Equivalent combined city-highway values will be ~12% lower.

Developments in other countries/regions on fuel efficiency standards:

- Australia is expected to unveil a regulatory impact assessment for 2015 and 2020 CO2 standards in December 2012.
- Vietnam has drafted fuel efficiency standards for passenger vehicles as well as 2-3 wheelers, and a draft notification is expected by December 2012 as well.
- Russia and Indonesia will soon be the two of the largest markets without a fuel efficiency standards.
For more information…

- EU LDV CO₂ Regulation: [http://www.theicct.org/policies/eu-light-duty-vehicle-co2-regulation](http://www.theicct.org/policies/eu-light-duty-vehicle-co2-regulation)
- CO₂ Standards: [http://www.theicct.org/issues/co2-standards](http://www.theicct.org/issues/co2-standards)

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