The Global Fuel Economy Initiative

2016 State of the World

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COP-22 Marrakech
Nov 12 2016
Content

- GFEI overview
- LDV review (IEA study)
- Shorter HDV review (ICCT study)
- EVs – one slide (UC Davis study)
Global Fuel Economy Initiative

Launched in 2009, now recognized as leading vehicle efficiency initiative in energy and climate reports and discussions

Core partners
Global Fuel Economy Initiative

**Target:** improve the fuel economy of cars
- 50% lower fuel use per km by 2030 (new registrations) and 2050 (stock) – benchmark 2005

**Activities**
- Analysis: data gathering, modeling, baseline development
- Evaluation: policy tools and options
- Strategy development: organization of dialogues
- Outreach: Awareness raising, communication

**Core partners**
Overall the global average fuel economy improved on average by 1.6% a year between 2005 and 2013.

This is significantly short of the 2.7% annual rate of improvement needed to achieve the GFEI targets by 2030.

The improvement rate was 2.5% a year on average in OECD countries, and 0.5% a year in non-OECD countries.

More progress is needed in all markets to achieve GFEI’s targets.
### GFEI Working Paper 12 (2016)

- Progress, but not on track

<table>
<thead>
<tr>
<th>Values published in this report (2016) including LCVs, based on WLTC</th>
<th>2005</th>
<th>2008</th>
<th>2011</th>
<th>2013</th>
<th>2030</th>
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<tbody>
<tr>
<td><strong>OECD average</strong>&lt;br&gt;average fuel economy (Lge/100km)</td>
<td>8.9</td>
<td>8.4</td>
<td>7.8</td>
<td>7.5</td>
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<tr>
<td>annual improvement rate (% per year)</td>
<td>-2.1%</td>
<td>-2.5%</td>
<td>-1.9%</td>
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<td><strong>Non-OECD average</strong>&lt;br&gt;average fuel economy (Lge/100km)</td>
<td>8.5</td>
<td>8.5</td>
<td>8.4</td>
<td>8.2</td>
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<td>annual improvement rate (% per year)</td>
<td>-0.1%</td>
<td>-0.4%</td>
<td>-1.2%</td>
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<td><strong>Global average</strong>&lt;br&gt;average fuel economy (Lge/100km)</td>
<td>8.8</td>
<td>8.4</td>
<td>8.0</td>
<td>7.8</td>
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<td>annual improvement rate (% per year)</td>
<td>-1.7%</td>
<td>-1.6%</td>
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<td><strong>GFEI target</strong>&lt;br&gt;average fuel economy (Lge/100km)</td>
<td>8.8</td>
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<td>required annual improvement rate (% per year) 2005 base year</td>
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<td>-2.7%</td>
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<td>required annual improvement rate (% per year) 2012 base year</td>
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<td>-3.3%</td>
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Historical fleet CO₂ emissions performance and current standards (gCO₂/km normalized to NEDC) for passenger cars

* Note that Japan has already exceeded its 2020 statutory target, as of 2013.
Cost-effectiveness analyses of light- and heavy-duty fuel economy and CO₂ standards

<table>
<thead>
<tr>
<th>Rule</th>
<th>Per-Vehicle Cost</th>
<th>Payback Period</th>
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<tbody>
<tr>
<td>US LDV 2017–2025¹</td>
<td>$1,800</td>
<td>3.5 years</td>
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<td>US LDV 2012–2016²</td>
<td>$950</td>
<td>3 years</td>
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<tr>
<td>US HDV Phase 1 2014 – 2017³</td>
<td>$378–$6,215</td>
<td>1–2 years</td>
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<tr>
<td>California Advanced Clean Cars Program 2017 – 2025⁴</td>
<td>$1,340–$1,840</td>
<td>3 years</td>
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<td>Canada LDV 2017-2025⁵</td>
<td>$2,095</td>
<td>2 to 5 years</td>
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<tr>
<td>Canada LDV 2011-2016⁶</td>
<td>$1,195</td>
<td>1.5 years</td>
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<tr>
<td>European 95g CO₂/km Standard 2020⁷</td>
<td>€1,300</td>
<td>4-5 years</td>
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<td>India LDV 2020⁸</td>
<td>$400 to $600</td>
<td>2–3 years</td>
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GFEI benchmarking analysis

- Aiming at monitoring developments against GFEI target over time
- Unique compilation of OECD and non-OECD data
- Covers more than 80% of the global car market
- 4th edition since 2010
Results

Impacts of policies

Case 1

- stringent fuel economy regulations in place
- monetary incentives (feebate, differentiated vehicle taxation based on CO₂/km)

Example in the figure: France
Results

Impacts of policies

Case 2

- NO fuel economy regulations
- NO monetary incentives

- Example in the figure: Chile (prior to the reform of 2015)
Results

Impacts of policies

Case 3

- NO fuel economy regulations
- Monetary incentives as of 2010

- Example in the figure: South Africa
Results

Impacts of policies

- Ambitious policy frameworks can effectively improve fuel economy and limit carbon emissions of cars
- Fuel economy policies had little effect on the weight or size of vehicles
- Differentiated vehicle taxation demonstrated a good capacity to improve fuel economies, even in the absence of regulatory measures
- In the absence of policies, the tendency for most vehicle attributes (including fuel use/km is to stagnate)
Comparative results
Performance vs. fuel economy

- Cars in the non-OECD tend to have lower power, but also technology that is less up-to-date than in OECD markets (higher fuel consumption per kW)
- Brazil, India and Indonesia have the highest fuel use/kW
Fuel economy versus weight and footprint

Values by model at different points in time, showing evolution of the diversity of the offer and changes over time

Example: market diversification in India

Diversification resulted in improved fuel economy, but also led to weight and footprint growth
Conclusions

- Fuel economy improvements have been occurring too slowly to hit GFEI 2030 targets
- Market shifts (non-OECD growth in market share) are less beneficial for global average than assessed before
- Policies matter: both fuel economy regulations and differentiated taxation worked. Combined use was very effective (e.g. in France)
- Monitoring matters (e.g. to understand policy formulation issues and revise strategies)
- 2014-15 data analysis now ongoing: the next report will keep country insights ad will include an analysis of prices
International HDV efficiency policy and technology potential

Oscar Delgado, Ben Sharpe, Josh Miller, Rachel Muncrief

The ICCT

GFEI side event at ITF
May 19, 2016
**HDV global regulatory landscape**

- Four countries in the world currently have HDV CO2/efficiency standards. Others are working towards standards.
- Annual improvement rates of standards vary across region and segment (for US Phase 1+2, tractor-trailer improvement ~2.5%/year).

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*Hashed areas represent unconfirmed projections of the ICCT*
Fuel consumption reduction with technology packages (tractor-trailers)

- Baseline and potential numbers take into account
  - Baseline technology level
  - Duty cycle
  - Payload
- Data is not reflective of how vehicles would perform in other markets
End point converges in 2050

Compared to Current Policies, the Moderate efficiency scenario could prevent the cumulative release of more than 27 Gt from 2015-2050

Advanced and World Class pathways could increase the cumulative emissions benefit by 5 and 8 Gt, respectively, compared to the Moderate scenario.
Summary/Conclusions

- HDV sector is behind LDV sector in implementation efficiency standards
  - Significant technology potential exists to improve the global HDV fleet
  - Technology forcing standards will be needed in the major markets in order to drive technology adoption

- Europe is currently the largest market without standards. As EU is very influential in global HDV policy and vehicle/engine market – it is key for EU to come online with a commitment for standards in the very near future

- “Tier 1” markets would ideally start developing now a stronger vision/roadmap for zero emissions technology, like electrification and fuel cell technology. Current pathway is not well defined and while there is still significant potential from incremental technology, the “end point” could start to be reached by 2030.

- Strong compliance programs required
  - Conformity of production and in-use verification requirements are needed to ensure that regulatory requirements translate to real-world improvement.
EVs: can we reach 100 million by 2030?

- UN Declaration on E-mobility calls for this, and is consistent with IEA 2 degree scenario
- Sales of BEVs and PHEVs by year across top 8 national markets growing quickly, but must continue with 30%+ annual growth for next 16 years
• Tracks trends, analysis of different vehicle markets
• Part two of report coming in 2017, with detailed projections and policy analysis for major markets, that will definitively answer the question:

Can the world reach 100 million EVs by 2030?