Toward 50by50: An Assessment of Prospects and Progress
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Executive Editor
GFEI 2010 Report

Making Cars 50% More Fuel Efficient by 2050 Worldwide
• **Purpose of report:**

  - To assess the prospects for reaching the 50by50 goal in the light of on-going research and other developments that have occurred over the past year or so

  - To assess the progress being made in reaching the goal
Report overview: Topics

1. Factors explaining current cross-country differences in average new car vehicle fuel economy
2. Recent studies of the technical potential to improve average new car fuel economy
3. “Technical potential” does not necessarily translate into equivalent actual improvement in average new car fuel economy even if technologies are adopted
4. Major policy initiatives recently finalized by the EU and the US to improve average new car fuel economy; policy initiatives being undertaken by certain other governments
5. Potential to accelerate fleet turnover: possible lessons from recent policy initiatives
6. Cross-country flows of used cars
7. GFEI capability building efforts
1. Factors explaining cross-country differences in average new car fuel economy
Cross-national comparisons in average new passenger vehicle fuel economy (L/100km) -- 2008

Average Fleet Fuel Consumption in 2008 – NEDC Cycle (L/100km)

Source: ICFI Report

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Within-class differences in average fuel economy performance by class and by country (L/100km) -- 2008

Source: ICFI report

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Market share by class by country -- 2008

Source: ICFI report

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Cross-national differences in fuel consumption performance: Findings and conclusions

- According to ICFI report:
  - Differences in diesel penetration, vehicle performance, weight, and the use of automatic transmissions almost completely explain the differences in class-specific fuel consumption across the OECD countries.
  - There is a technology opportunity of about 10% in most high sales volume classes in China.
  - There also is a significant technology opportunity in the high sales volume segments in India, but this must be tempered by the fact that the opportunities are in very cost sensitive segments.
2. Recent studies of the technical potential to improve new LDV fuel economy
US National Research Council: Potential Reduction of New US LDVs by MY2020 and MY2035 relative to MY2006 Using Different Powertrain Types

Source: Compiled from NRC 2009

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MIT Laboratory for Energy Research and the Environment: Technical potential to reduce fuel consumption in European vehicles by 2035

Source: Compiled from Bandivadekar, 2008

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Technical potential to achieve the GFEI goals: Findings and conclusions

• The GFEI is correct in asserting that “…the technologies required to improve the efficiency of new cars 30% by 2020 and 50% by 2030…mainly involve incremental change to conventional internal combustion engines and drive systems, along with weight reduction and better aerodynamics…”
3. “Technical potential” does not necessarily translate into equivalent improvement in fuel economy even if technologies are adopted.
Between the mid-1980s and about 2005, US fuel economy (as tested) declined even though the technical potential to improve fuel economy of these vehicles increased.

Lab fuel economy (mpg) and ton-miles per gallon: New US Light-Duty Vehicles, 1975-2009


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During this period, all the improved technical potential to increase fuel economy was instead used to increase vehicle weight and performance.


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Evolution of Fuel Economy and Weight for New Passenger Vehicles in the US, EU, and Japan: 1990-2004

![Graph showing the evolution of fuel economy and weight for new passenger vehicles in the US, EU, and Japan from 1990 to 2004. The graph compares specific fuel efficiency and mass across different years.]

Source: Adapted from IEA, 2009

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What might be required to reduce average new US LDV fuel consumption by 50% by 2035?

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<tr>
<th>Date</th>
<th>% ERFC²</th>
<th>% Light Trucks³</th>
<th>% Vehicle Weight Reduction⁴</th>
<th>% Market Share by Powertrain</th>
<th>Fuel Consumption Reduction (%)</th>
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<td>Fuel Consumption Reduction (%)</td>
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Notes: ¹ The “Optimistic” scenario meets the CAFE target of 35 mpg in 2020, and then extrapolates this rate of improvement through 2035. In this case, the average fuel economy in 2035 reaches 52 mpg, roughly double today’s value.

² ERFC = Emphasis on reducing fuel consumption; indicates the tradeoff between vehicle performance and fuel consumption

³ Current level is approximately 50%

⁴ Assumed average new vehicle weight (cars and light trucks) currently is 1,900 kg (4,180 lb). Thus average weight reductions per vehicle of 700 lbs (318 kg) to 1050 lbs (476 kg) would be required.

Source: NRC 2009
4. Major policy initiatives recently finalized by the EU and the US; policy initiatives being undertaken by certain governments

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Actual average fleet fuel efficiency data through 2008 and nearest targets enacted or proposed thereafter

Source: ICCT 2009

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5. Potential to accelerate fleet turnover: Possible lessons from recent policy initiatives

Source: ICCT 2009

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During the recent severe recession, many countries have adopted policies to enhance vehicle sales.

Source: Bastard, 2010

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What have we learned from these efforts?

- Research on topic sponsored by GFEI is ongoing

- Results of recently-released US GAO study:
  - The CARS program [“Cash for Clunkers”] helped to stimulate the economy, thereby achieving one of its broad objectives.
  - The extent to which the program stimulated vehicle sales, as measured by the number of vehicle sales attributable to the CARS program, is unclear.
  - The CARS program put more fuel-efficient vehicles on the road, thereby achieving one of the program’s broad objectives….The average combined fuel economy of trade-in vehicles was 15.7 miles per gallon and that of new vehicles was 24.9 miles per gallon, a 58.6 percent increase in fuel economy.
  - [T]he extent to which the program reduced overall fuel consumption is uncertain.
  - [A]lthough preliminary analysis indicates that the program will have a significant net reduction in energy consumption and greenhouse gas emissions, the magnitude of the net reduction is very sensitive to the expected remaining life of the trade-in vehicle in the absence of the CARS program.

Source: United States Government Accountability Program, Lessons Learned from Cash for Clunkers Program: Report to Congressional Committees, GAO-10-486, April 2010
6. Cross-border flows of used cars

Source: United States Government Accountability Program, Lessons Learned from Cash for Clunkers Program: Report to Congressional Committees, GAO-10-486, April 2010

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Cross-border flows of used vehicles are significant

Data for Mexico: October 2005-July 2008

We need to understand the volume as well as the emissions and energy use characteristics of internationally-trade used vehicles

Estimated flows by region for 2005

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7. GFEI capability building efforts
The GFEI’s commitment to enhancing capability

• “The global initiative will support the development and strengthening of fuel economy policies by governments worldwide. A first step will be to better understand the relevant policy development processes and frameworks, and report on the current status of fuel economy policies in key countries.”

• “On the basis of this information the initiative, led by UNEP, plans to develop a fuel efficiency policy “Tool Kit” which will provide information to governments and their partners on possible policies and action to improve national fuel efficiency.”

• “In the first year of the initiative, a broad dialogue will be launched in countries around the world, with the possibility of developing more intensive work with organisations in a few countries, or regional groups of countries, based on expressions of interest. To facilitate this policy dialogue, GFEI is planning to organise events at the global, regional and national level to promote fuel efficiency policy initiatives in general and the GFEI targets in particular.”

Source: “50by50” Program Document
“Improving Vehicle Fuel Economy in the ASEAN Region” – Joint Project of 50by50 and CAI Asia

Note: ASEAN = Association of Southeast Asian Nations; ASEAN countries included are Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam. Source: Asian Development Bank and Clean Air Initiative-Asia. 2009 (draft).

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Growth of Motor Vehicles per Mode for 6 ASEAN Countries (Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam)

MC-two = Motorized motorcycles; MC-three = Motorized three-wheelers; PC = Personal cars; LCV = Light commercial vehicles; HCV = Heavy commercial vehicles
Page from UNEP’s draft toolkit

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Findings and Conclusions: The “bottom line” (1)

• Based on recent literature, incremental technologies available to improve fuel economy are estimated to be able to cut average new car fuel consumption by around 50% at least for OECD countries -- and possibly worldwide -- across the time frame 2005-2030. These are the findings of well known engineering studies in the US (e.g., Heywood 2008) and Europe (e.g., King 2007) and are confirmed by other relevant work discussed in this report.

• This suggests that by around 2030 average new car fuel economy in many OECD countries might be close to 4 L/100km (25 km/L, 60 mpg) or 90gCO2/km. An indicative target of 25 km/L also seems feasible around 2030 for large car markets in developing countries such as China and India, given the lower average weight of vehicles in these markets.
Findings and Conclusions: The “bottom line” (2)

- However, to meet GFEI 50% target around the world, (and its implication of achieving something close to 4 L/100km on average), it may be necessary in some countries to supplement technology-based improvements with shifts in size mix and performance (i.e. reductions, rather than just holding steady for some OECD countries, and moderated increases in some non-OECD countries). It may also be necessary to introduce plug-in electric drive vehicles, in order to benefit from the efficiency improvements associated with these vehicles. More research on fuel economy status and trends for various countries around the world will help to better elucidate the need for such supporting actions, beyond relying on technology to achieve targets. The GFEI plan to develop vehicle fuel economy baseline and trend data for more countries and regions should play a valuable role in this regard.
Findings and Conclusions: The “bottom line” (3)

- From a policy perspective, the key to achieving this scale of improvement is creating a regulatory and fiscal environment that steers manufacturers to using technological improvements to deliver fuel economy rather than enhanced performance and heavier vehicles and that steers consumer demand towards more energy-efficient vehicles. In order for manufacturers to make the necessary investments in engine and auto plants the regulatory framework needs to create certainty. Risks are minimized when binding targets are set well in advance. This underlines the importance of early conversion of the EU’s 95gCO2/km target into an agreed emissions standard and for other countries to adopt standards that apply 10 or more years in the future.
Findings and Conclusions: The “bottom line” (4)

• Finally, it is important for those countries that have not done so, especially those that will experience major growth in their vehicle fleets in the coming years, to start developing national fuel economy initiatives now. This will ensure that the necessary fiscal and regulatory environments are in place to achieve significantly improved fuel economy. The GFEI has begun a process to help regions and countries move forward in this regard.

• The GFEI should also work toward raising awareness and capacity of lawmakers, stakeholders, and the general public on the issue of fuel economy. This can be done by supporting labeling programs, public information campaigns, and continued use of workshops and conferences to share information and recent research.
Thank you. Questions?
Global Fuel Economy Initiative – The Partners