FACT SHEET: EUROPE

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THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

# FUEL EFFICIENCY TECHNOLOGY IN EUROPEAN HEAVY-DUTY VEHICLES: BASELINE AND POTENTIAL FOR THE 2020–2030 TIMEFRAME

## BACKGROUND

In the European Union, $CO_2$ emissions from commercial vehicles grew much faster than from passenger vehicles from 1990 to 2014. In that period, $CO_2$ emissions from commercial vehicles increased by 25%, while passenger car emissions rose only 12%. Trucks and buses now produce about a quarter of $CO_2$ emissions from road transport in the EU, and that share is growing as emissions from cars and vans decline further to meet increasingly tight $CO_2$ standards.

Mandatory $CO_2$ standards have been in place for passenger cars and vans in the EU since 2009. Comparable requirements have never been defined for heavy-duty vehicles (HDVs), but that will soon change: an HDV standard proposal is anticipated in 2018. Experience has shown that non-binding targets and market forces alone are not sufficient to drive the GHG reductions necessary to meet the EU's carbon reduction goals. The average fuel efficiency of tractor-trailers in the European Union has remained essentially unchanged for the past decade.

This report, which details the results of research done using vehicle simulation modeling, summarizes the current fuel efficiency performance of new heavy-duty freight-hauling vehicles in the EU and outlines the technological potential for improving fuel-efficiency and

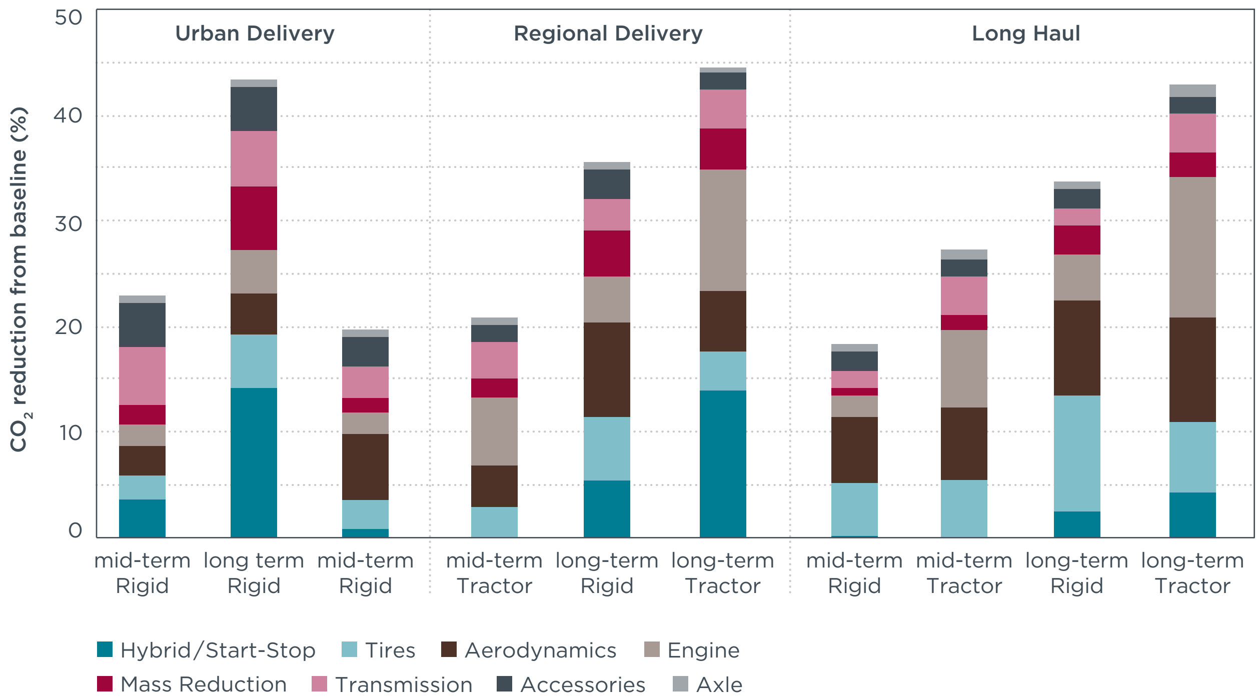


**Figure 1.** There is significant technology potential to improve the fuel-efficiency and reduce the $CO_2$ emissions of the average freight truck in the EU in both the mid-term (now to 2025) and long term (2030).

reducing $CO_2$ emissions in that part of Europe's heavy-duty fleet in the 2020–2030 timeframe. The analysis focuses on two vehicle segments on either end of the freight hauling operational spectrum: long-haul tractor-trailers and urban rigid delivery trucks. These segments represent approximately 85% of HDV $CO_2$ emissions.

## KEY FINDINGS

1. **Current vehicle baseline.** The baseline fuel consumption of a typical 2015 European 40-tonne 4x2 tractor-trailer over the proposed regulatory Long Haul cycle is 33.1 L/100km. Similarly, the baseline fuel consumption of a typical 2015 European 12-tonne 4x2 rigid truck over the proposed regulatory Urban Delivery cycle is 21.4 L/100km.

2. **Tractor-trailer potential in the mid-term.** Compared to the baseline tractor-trailer, available efficiency technologies can reduce fuel use by 27% in long-haul operation. This amounts to a reduction in fuel consumption from the tractor-trailer baseline of 33.1 L/100km to 24.0 L/100km. The corresponding average annual reduction is 3.1% per year from 2015 to 2025.

3. **Tractor-trailer potential in the long-term.** Compared to the baseline tractor-trailer, well-known but not yet widely commercialized technologies can achieve a 43% fuel consumption reduction in long-haul operation by 2030. This would require an average annual reduction from 2015 to 2030 of 3.6%, reducing the fuel consumption of new tractor-trailers to 18.9 L/100km by 2030.

4. **Rigid truck potential in the mid-term.** The application of available technologies to the baseline 12-tonne delivery truck results in a 23% reduction in fuel consumption. Starting from a baseline fuel consumption of 21.4 L/100km, mid-term technology would reduce fuel consumption to 16.5 L/100km. The corresponding average annual reduction is 2.6% per year from 2015 to 2025.

5. **Rigid truck potential in the long-term**. The long-term package consists mostly of technologies that are not yet commercialized, with the exception of a hybrid-powertrain. The long-term package results in a 43% reduction in fuel consumption from the 2015 baseline, an annual improvement of around 3.6% per year from 2015–2030. This amounts to a reduction in fuel consumption from a baseline of 21.4 L/100km to 12.1 L/100km by 2030.

## POLICY IMPLICATIONS

1. **Regulatory baseline.** Determining the baseline is key to the development of a $CO_2$ emissions standard. The EU recently adopted a $CO_2$ and fuel consumption certification procedure based on a vehicle simulation tool that determines an official $CO_2$ value for new HDVs. The EU has indicated its intention to use that certification procedure for the upcoming HDV $CO_2$ standard. But waiting for official fleetwide $CO_2$ values would be an unnecessary delay and could jeopardize the goal of proposing HDV $CO_2$ standards in 2018. The findings of this study, which modeled a baseline tractor-trailer and a baseline rigid truck that represent the sales-weighted average of each vehicle segment, could be used to inform the regulatory baseline.

2. **Stringency.** The technologies evaluated for the study were grouped into mid-term and long-term technology packages. Mid-term technologies are already commercially available but have achieved only a slight market penetration. Long-term technologies are not yet commercialized but are near commercialization, have been demonstrated in prototype, or have a proven pathway to development. An regulation that sets standards stringent enough only to incentivize the mid-term technologies could be considered "technology tracking," as it mainly works to increase the fleetwide adoption of "off-the-shelf" or existing technologies. An efficiency standard stringent enough to incentivize long-term technologies could be considered "technology forcing" as it would work to pull technologies into the market faster than would occur because of market forces alone. Determining regulatory stringency entails determining the amount of improvement from the regulatory baseline that the standard will compel. Key to that decision is information on potential for improvement using known technology, timing of the commercial availability of a given technology, technology applicability across a given vehicle class, and technology cost and payback. The analysis performed in this report covers the first two topics.

3. **Technology accounting.** The EU plans to use the vehicle simulation tool developed for HDV $CO_2$ certification to set future HDV $CO_2$ standards. That model does not account for all technologies that were considered in this study, and the difference can have significant effects on the level of potential improvement that the model estimates. Trailer technologies and hybrid powertrains, neither of which are accounted for in the EU simulation tool, illustrate the problem. For tractor-trailers, out of the total 43% fuel consumption reduction estimated in this study, approximately 15% derives from improvements made to the trailer. For rigid delivery trucks, out of the total 43% fuel consumption reduction estimated in this study, approximately 14% is due to the use of a hybrid powertrain. Failure to account for potential technological advances in these areas of vehicle design, and others, will result in decisions on stringency that are less well-informed than they could be—and standards that are less effective than they should be.

4. **Timing and benefits.** The phase-in timing for any efficiency regulation will play a large part in determining the benefits in a given year. The European Union has set binding $CO_2$ reduction targets for 2030. An HDV $CO_2$ standard that mandates annual sales-weighted average reductions of 2% per year from the new vehicle fleet starting in 2020 would result in a 10% fleetwide reduction in $CO_2$ emissions in the year 2030 compared to the business-as-usual scenario. However, if the same standard was put in place but did not begin until 2025, the overall benefits in 2030 would be only 3% better than the business-as-usual case. Therefore, timing as well as stringency should be considered to maximize the benefits by 2030.

## FURTHER READING

» Heavy-duty vehicles technology potential and cost study. http://theicct.org/HDV-technology-potential-and-cost-study

» Market penetration of fuel efficiency technologies for heavy-duty vehicles in the European Union, the United States, and China. http://theicct.org/market-penetration-HDV-fuel-efficiency-technologies

» Estimating the fuel efficiency technology potential of heavy-duty trucks in major markets around the world. http://theicct.org/estimating-fe-tech-potential-hdvs-gfei-wp14

**PUBLICATION DETAILS**

*Fuel Efficiency Technology in European Heavy-Duty Vehicles: Baseline and Potential for the 2020–2030 Time Frame*

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**Download:**
http://theicct.org/EU-HDV-fuel-efficiency-tech-2020-2030

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