Improving fuel economy of tractor-trailers, buses, work trucks

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A new congressionally mandated report from the National Research Council evaluates various technologies and methods that could improve the fuel economy of medium- and heavy-duty vehicles, such as tractor-trailers, transit buses, and work trucks. The report also recommends approaches that federal agencies could use to regulate these vehicles' fuel consumption. Currently there are no fuel consumption standards for such vehicles, which account for about 26 percent of the transportation fuel used in the U.S.

"The choices that will be made over the course of the next few years will establish the regulatory design for medium- and heavy-duty vehicle fuel consumption standards for the next several decades," said Andrew Brown Jr., chair of the committee that wrote the report, and executive director and chief technologist at Delphi Corp., Troy, Mich. In 2007 Congress passed legislation requiring the U.S. Department of Transportation for the first time in history to establish fuel economy standards for medium- and heavy-duty vehicles. The National Highway Traffic Safety Administration asked the National Research Council to recommend the best ways to measure and regulate fuel economy for these vehicles, and assess technologies that could improve it.

The committee estimated the improvements that various technologies could achieve over the next decade in seven vehicle types. For example, using advanced diesel engines in tractor-trailers could lower their fuel consumption by up to 20 percent by 2020, and improved aerodynamics could yield an 11 percent reduction. Hybrid powertrains could lower the

fuel consumption of vehicles that stop frequently, such as garbage trucks and transit buses, by as much 35 percent in the same time frame. While the cost of making these improvements would be passed on to vehicle purchasers, the report notes that many of these suites of technologies would pay for themselves even at today's energy prices, under the committee's assumptions.

The report also estimates the costs and maximum fuel savings that could be achieved for each type of vehicle by 2020 if a combination of technologies were used. The best cost-benefit ratio was offered by tractor-trailers, whose fuel use could be cut by about 50 percent for about $84,600 per truck; the improvements would be cost-effective over ten years provided gas prices are at least $1.10 per gallon. The fuel use of motor coaches could be lowered by 32 percent for an estimated $36,350 per bus, which would be cost-effective if the price of fuel is $1.70 per gallon or higher. For other vehicle classes, the financial investments in making improvements would be cost-effective at higher prices of fuel.

In setting fuel consumption standards, regulators should use a measure that accounts for the amount of freight or passengers carried by these vehicles, the report says. The miles-per-gallon measure used to regulate the fuel economy of passenger cars (light-duty vehicles) is not appropriate for medium- and heavy-duty vehicles, which are designed above all to carry loads efficiently, the report says. For example, a partially loaded tractor-trailer could travel more miles per gallon than a fully loaded one, but this would not be an accurate measure of the fuel efficiency of moving goods.

Instead, any regulation of medium- and heavy-duty vehicles should use a metric that reflects the efficiency with which a vehicle moves goods or passengers, such as gallons per ton-mile, a unit that reflects the amount of fuel a vehicle would use to carry a ton of goods one mile. This is

called load-specific fuel consumption (LSFC).

The report does not recommend a specific numerical standard because NHTSA will need to establish standards tied to the task associated with a particular type of vehicle; garbage trucks might be held to a different standard than transit buses, for example. NHTSA should base its regulations on national data on the average payload carried by each type of vehicle. The agency should regulate the final-stage vehicle manufacturers rather than component makers, as the former has the greatest control over the vehicle's design, the report adds. "Our committee also recommends that NHTSA conduct a pilot program to 'test drive' the certification process and validate the regulatory framework," said Brown.

While regulating medium- and heavy-duty vehicles will be more complicated than it is for passenger cars because of the variety of vehicles and their differing tasks and terrains, the barriers are not insurmountable, the report says. Japan regulates the fuel economy of these vehicles, and both the European Union and the state of California are developing standards.

However, one way to avoid the complexity of regulating different types of vehicles would be to impose a fuel tax, which would induce firms to optimize the fuel-efficiency of their operations. The report urges Congress to consider this approach. Another alternative approach -- applying a cap-and-trade system to trucking companies similar to the one that Congress is considering as a way to lower CO2 emissions -- would similarly provide these companies with an incentive to adopt fuel-saving technologies and operational methods.

In addition, the report recommends nontechnical methods NHTSA could use to lower fuel consumption, including providing incentives to train vehicle operators in efficient driving techniques, which can result in fuel

savings of anywhere from 2 percent to 17 percent. One approach could be to establish a process to train and certify drivers in these techniques as part of commercial driver license certification.

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