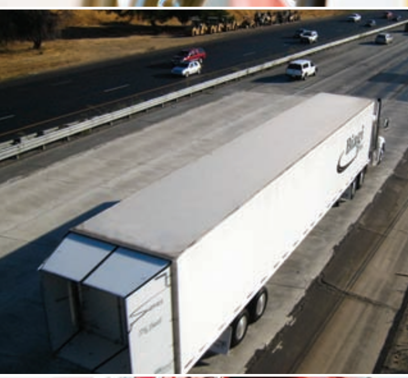




Delivering Jobs

The Economic Costs and Benefits of Improving the Fuel Economy of Heavy-Duty Vehicles

Union of Concerned Scientists

CALSTART

Introduction

Medium- and heavy-duty trucks account for only 4 percent of all vehicles on U.S. highways. Yet these trucks consume more than 20 percent of the diesel and gasoline used to power all vehicles on the nation's roads—or more than 37 billion gallons of fuel.[1]

Unlike the fuel economy of cars and light trucks, the federal government has never regulated the fuel economy of medium- and heavy-duty vehicles. As a result of those missing standards and other market failures, these vehicles currently average about six miles per gallon, and have made only modest gains in fuel economy over the past 30 years.[2] That means this segment of vehicles represents a huge untapped resource for saving fuel.

In its recent *Climate 2030* report, the Union of Concerned Scientists (UCS) found that widespread adoption of existing and near-term efficiency technologies could boost the average fuel economy of medium- and heavy-duty trucks to 9.7 mpg by 2030.[3] What's more, by investing in those technologies, the United States could save a total of 100 billion gallons of diesel and gasoline from 2010 to 2030, with annual savings reaching 11 billion gallons in 2030.

To investigate the economic impact of improving the efficiency of medium- and heavy-duty trucks, UCS collaborated with CALSTART, a consortium that focuses on clean transportation technology, and MRG & Associates, a resource analysis and planning firm. Building on results from *Climate 2030*, these analysts evaluated the effects of investments in advanced truck technologies on jobs across the nation, gross domestic product, and truck owners themselves.

These analyses show that the economic benefits of investing in advanced fuel-efficiency technologies far outweigh their costs. In fact, making trucks more fuel-efficient could save their owners money at the pump, create tens of thousands of jobs across the economy, reduce the nation's dependence on petroleum, and help combat climate change.

Jobs and Economic Growth

- Widespread deployment of more-efficient trucks would create 63,000 additional jobs by 2020, and 124,000 jobs by 2030. All states would see net job growth. California, Texas, Florida, New York, Ohio, Illinois, Pennsylvania, Indiana, and Michigan would lead the way, with each adding more than 4,000 jobs by 2030 (MRG 2010; Cleetus, Clemmer, and Friedman 2009).
- Fuel and cost savings from advanced trucks would spur a $4 billion increase in annual gross domestic product by 2020 and a $10 billion increase by 2030 (MRG 2010; Cleetus, Clemmer, and Friedman 2009).

Savings for Truck Owners

- Owners of advanced heavy-duty tractor-trailers could save $120,000 or more per truck over eight years, after paying back their initial $62,000-per-truck investment. Owners of large fleets of package delivery trucks or long-haul tractor-trailers could save hundreds of millions of dollars over 8 to 12 years[4] (CALSTART 2010).
- Ramping up investments to $4.7 billion in 2020 and $13.5 billion in 2030 in more-efficient trucks, the nation would reap annual savings of $10 billion by 2020 and $24 billion by 2030—over and above the initial costs of the technology[5] (Cleetus, Clemmer, and Friedman 2009).

Energy Security and Climate Benefits

- Investments in efficient medium- and heavy-duty trucks could save a total of 100 billion gallons of diesel and gasoline from 2010 to 2030. Annual fuel savings in 2030 alone could top 11 billion gallons (Cleetus, Clemmer, and Friedman 2009).
- Those fuel savings would reduce global warming emissions by a total of 140 million metric tons in 2030—the equivalent of removing 21 million of today's cars and trucks from the road (Cleetus, Clemmer, and Friedman 2009).

However, our analyses also show that despite the cost-effectiveness of truck fuel-efficiency technologies and the benefits these technologies provide to the nation in the form of jobs and economic growth, market barriers have prevented (and will continue to prevent) their widespread adoption. These barriers include the common industry practice of considering only short-term fuel savings—often over the first two years or less—and uncertainty regarding the future price of fuel. Newer technologies face additional challenges, including high incremental costs and lack of good information on technology performance, reliability, and resale value.

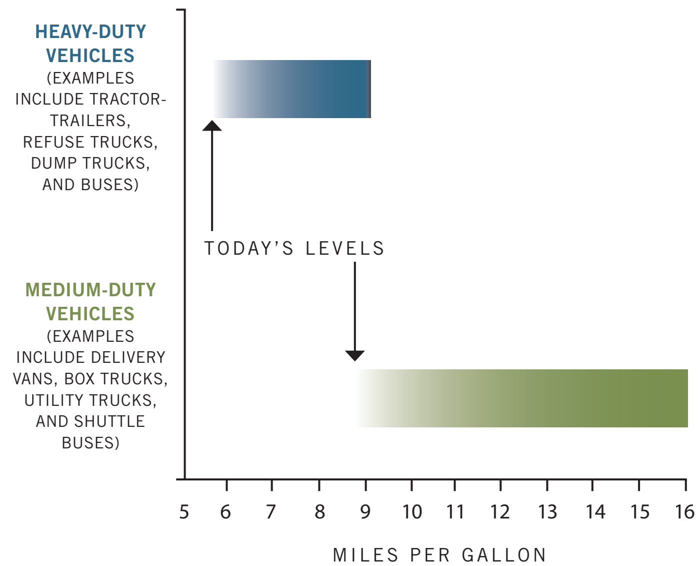
These findings suggest that the nation needs strong, smart, and consistent policies to overcome market barriers and realize the powerful economic and environmental benefits of advanced truck technologies. Such a package would include performance standards for trucks as well as incentives that spur the industry to speed the development, production, and use of cost-effective fuel-efficiency technologies.

Improving Energy Security and Reducing Emissions with More-Efficient Trucks

As noted, these analyses rest on modeling performed for *Climate 2030: A National Blueprint for a Clean Energy Economy*, which investigated the long-term economic and environmental impact of ambitious investments in clean energy technologies. Among other components, *Climate 2030* modeled widespread deployment of advanced fuel-efficiency technologies for trucks over the next 20 years.

In that scenario, manufacturers and fleet owners ramp up their investments in such technologies to $4.7 billion in 2020 and $13.5 billion in 2030. As a result of those investments, the average fuel economy of new medium- and heavy-duty trucks increases more than 60 percent by 2030 (Figure 1).

Figure 1. POTENTIAL IMPROVEMENTS IN AVERAGE NEW TRUCK FUEL ECONOMY 2010–2030



Technologies now available—and those that mature over the next decade—could boost the fuel economy of new medium- and heavy-duty trucks more than 60 percent by 2030. The gains would vary with the type of truck and its use. For example, the fuel economy of long-haul, heavy-duty tractors pulling box trailers could double, while flatbed and regional trucks may see smaller gains.

Climate 2030 also found that savings on fuel costs from those investments would far exceed the up-front costs of the technologies. Given fuel prices of about $3.50 per gallon, net economy-wide savings would total nearly $10 billion in 2020, and $24 billion in 2030.[6] The resulting fuel savings would prevent the release of a total of 140 million metric tons of global warming emissions in 2030—the equivalent of taking 21 million of today's passenger vehicles off the road—while also improving the nation's energy security.[7]

The diversity of truck types and uses—from tractor-trailers and delivery vans to cement mixers and refuse trucks—means that manufacturers and vehicle owners would rely on various technologies to achieve those gains. Some technologies are available now but have not been widely adopted because of market failures, while others could be commercialized over the next 5 to 10 years.

Snapshot: The Truck Industry Today

Together, truck manufacturers and the trucking industry constitute a linchpin of the U.S. economy. Trucks are also major users of fossil fuels, and thus contributors to global warming.

- More than 9 million medium- and heavy-duty trucks and buses travel the nation's roads and highways, providing essential services such as moving the nation's goods, fighting fires, and responding to power outages.
- In 2008, medium- and heavy-duty vehicles consumed 37 billion gallons of diesel and gasoline.[8]
- These vehicles account for 18 percent of all heat-trapping emissions from the U.S. transportation sector.[9]

Fuel-Saving Potential of Advanced Tractor-Trailers

Long-haul, heavy-duty tractor-trailers now consume some 22 billion gallons of fuel per year. That is the largest amount of fuel used by any sector of the U.S. medium- and heavy-duty trucking industry.[10] Recent analyses of efficiency technologies for long-haul tractors pulling van trailers—the most common configuration—show that fuel economy gains of 65 to 100 percent are possible by 2017.[11]

Such technologies include advanced aerodynamics and tires with low rolling resistance for both tractors and trailers, and incremental improvements in engine performance through better combustion techniques and reduced friction. Other technologies include waste-heat recovery, which converts exhaust heat from the diesel engine into mechanical or electrical energy, and hybrid drivetrains, which improve efficiency and reduce idling.

Fuel-Saving Potential of Advanced Medium-Duty Trucks

Medium-duty-trucks—such as those used to deliver packages—could also benefit from better aerodynamics, tires with less rolling resistance, more-efficient conventional and electric-hybrid drivetrains, and lightweight materials. According to two recent analyses, hybridization alone could boost fuel efficiency 40 percent or more, while a combination of more conventional technologies could improve fuel efficiency by more than 35 percent.[12]

Today's first-generation hybrid trucks are already delivering results. The National Renewable Energy Laboratory recently found that United Parcel Service (UPS) hybrid-electric delivery vans have achieved fuel economy gains of 29 to 37 percent.[13] Utilities using hybrid-electric bucket trucks have achieved gains of 14 to 58 percent across 14 fleets.[14]

Improving Truck Efficiency Creates Jobs

Analysts at MRG & Associates used information in *Climate 2030* on the costs of investments in cleaner truck technologies and the savings that would result in 2020 and 2030 to estimate the impact on employment and GDP. This analysis shows that a transition to more-efficient trucks would create a significant number of new jobs throughout the economy—in every state.

First, investments in advanced technologies would create jobs in the manufacturing sector, as companies hire more engineers and skilled workers to design and assemble added components for heavy-duty vehicles. Second, as more-efficient trucks lower operating costs for owners of trucking fleets and individual owner-operators, they would either retain those savings or pass them on to consumers through lower shipping rates.

Those owners and consumers, in turn, would invest those billions of dollars in other goods and services throughout the economy, including more fuel-efficient trucks. Ultimately, improving truck efficiency would create tens of thousands of jobs nationwide.

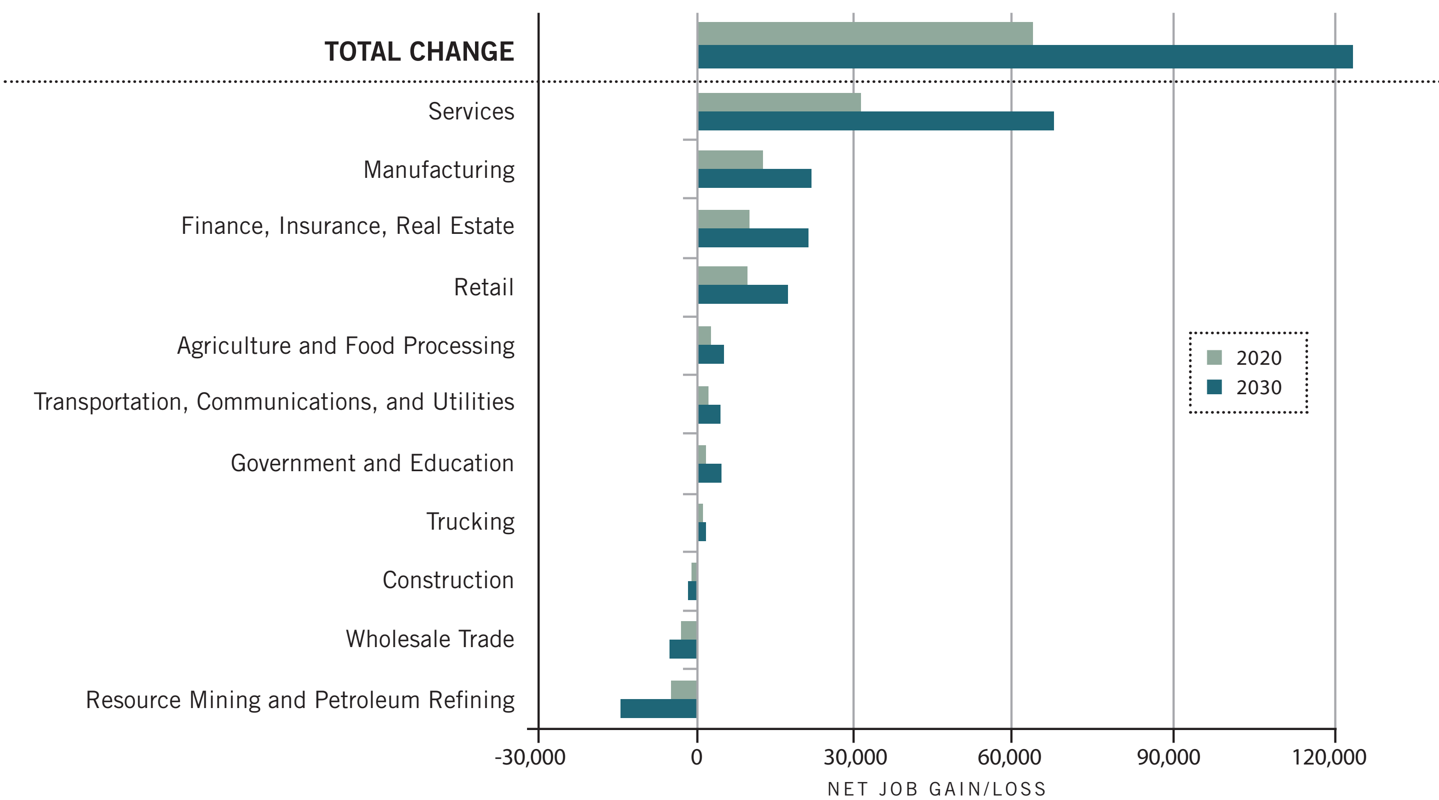
In fact, analysis of the *Climate 2030* scenario shows that cost savings from the use of more-efficient trucks would create 63,000 jobs nationwide in 2020, and 124,000 jobs in 2030, while GDP would expand $4 billion by 2020 and $10 billion by 2030.[15] The job gains would occur across most sectors of the economy, from manufacturing and trucking to retail and other services. These job increases would more than offset job losses stemming from declining demand for fuel due to more-efficient trucks (Figure 2).

In fact, every state would stand to gain some jobs by 2020 and 2030. States with significant manufacturing bases, such as Illinois and Michigan, and those with high consumption of fuel for trucks, such as California and Texas, would benefit the most. Those states, plus Florida, New York, Ohio, and Pennsylvania, would lead the way, with each state adding more than 2,000 jobs by 2020, and 4,000 jobs by 2030 (Table 1, p. 6).

More-Efficient Trucks Save Owners Money

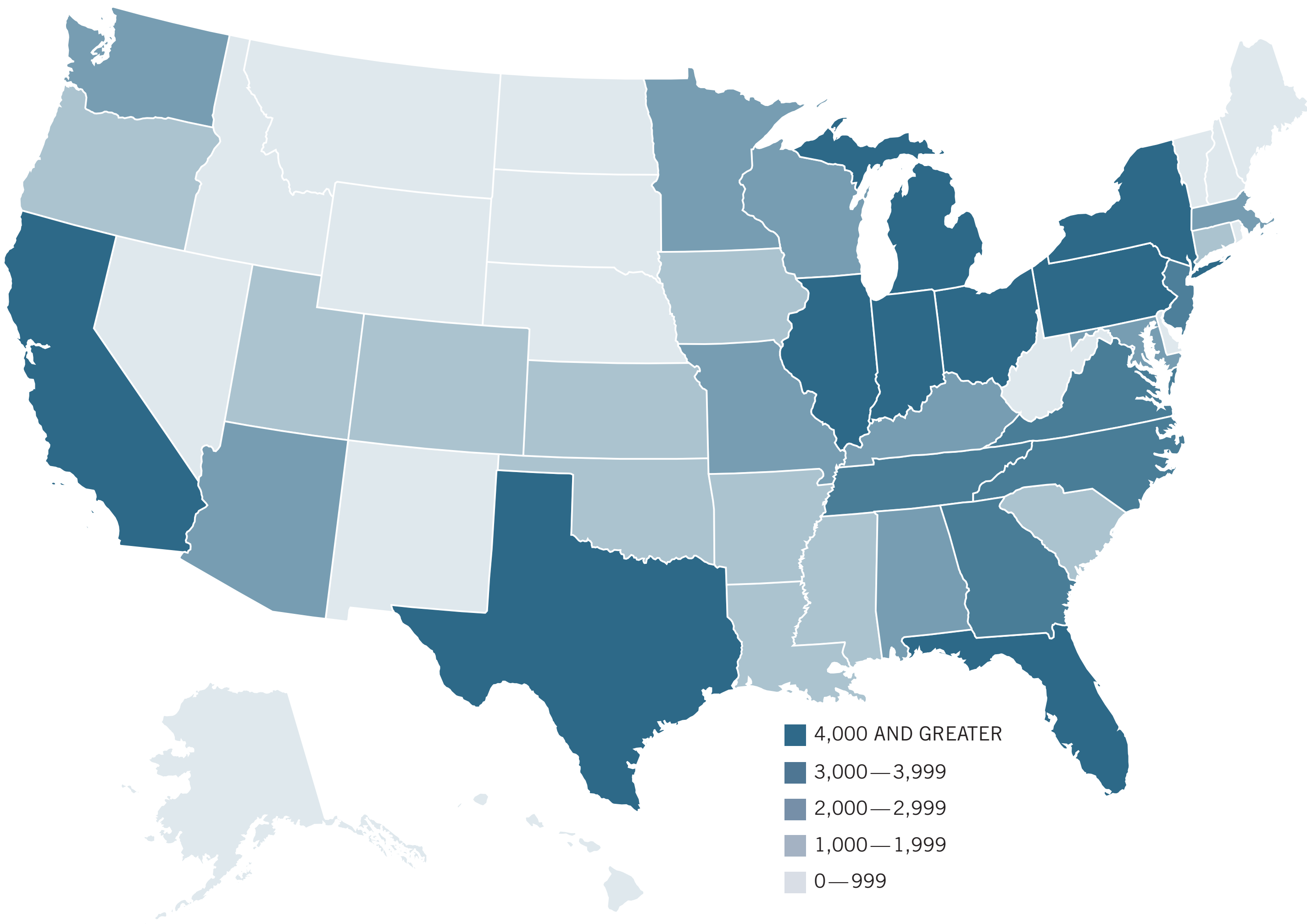
To further analyze the economic impact of investments in advanced truck technologies during the 2020 to 2030 time frame, CASTART assessed the costs and benefits of such investments for three types of end users: owners of package delivery fleets, owners of long-haul

Figure 2. NET CHANGE IN EMPLOYMENT BY SECTOR



Analysis of results from the UCS report *Climate 2030* shows that a large-scale investment in more-efficient trucks would create jobs in most sectors, including manufacturing. The gains would partly reflect a shift in spending to sectors that are more productive than those related to fuel. Those gains more than offset job losses in fuel-related sectors. Source: MRG 2010.

Table 1. STATE BY STATE JOB GROWTH IN 2030 FROM MORE-EFFICIENT TRUCKS



TOP 20 STATES BY JOBS CREATED

RANK	STATE	2020	2030
1	CALIFORNIA	6,820	13,650
2	TEXAS	4,570	8,150
3	FLORIDA	3,260	6,570
4	NEW YORK	3,000	6,010
5	OHIO	2,980	5,730
6	ILLINOIS	2,770	5,440
7	PENNSYLVANIA	2,680	5,300
8	INDIANA	2,140	4,080
9	MICHIGAN	2,130	4,040
10	GEORGIA	1,990	3,960

RANK	STATE	2020	2030
11	NORTH CAROLINA	1,910	3,720
12	NEW JERSEY	1,660	3,330
13	VIRGINIA	1,640	3,260
14	TENNESSEE	1,540	3,020
15	MISSOURI	1,500	2,940
16	WASHINGTON	1,490	2,970
17	WISCONSIN	1,390	2,700
18	MINNESOTA	1,230	2,430
19	KENTUCKY	1,210	2,350
20	MASSACHUSETTS	1,190	2,430

A transition to more-efficient trucks would spur net job growth in every state by 2030. To produce these estimates, analysts allocated the net increases in jobs nationwide shown in Figure 2 to each state. The analysts based that allocation on each state's share of employment by sector, and changes in the use of diesel fuel in each state owing to more-efficient trucks.

trucking fleets, and tractor-trailer owner-operators. To compare actual benefits with industry practice and assumptions, the analysts used both a life-cycle cost model and a simple two-year payback model—the latter common practice in the industry.

The life-cycle model—the primary focus of the analysis—considers capital costs, operations and maintenance costs, and the residual value of the vehicle over the period of vehicle ownership. The model also assumes a fuel price of $3.50 per gallon, and discounts future fuel savings at a rate of 7 percent per year.[16] This approach gives a more complete picture of the cost savings and benefits of investments in advanced truck technologies than the two-year simple payback calculation. CALSTART developed the life-cycle cost model based on experience with fleet user groups in the Hybrid Truck Users Forum, and by talking with representatives of truck fleets.[17]

The life-cycle approach shows that advanced, fuel-efficient trucks will more than pay for themselves over a typical ownership period (see below).[18] However, the industry practice of demanding a quick payback, and a lack of real-world experience with new technologies, means that the nation will need policies and incentives to encourage widespread adoption of these technologies.

Package Delivery Fleets

The life-cycle analysis shows that package delivery fleets can expect to save $11,000 to $26,000 per truck for diesel and gasoline box trucks over a typical service life of 12 years—given an average 75 percent gain in fuel efficiency from advanced technology packages (Table 2, p. 8).[19] The packages considered here include hybrid drivetrains, aerodynamic improvements, engine and transmission upgrades, tires with low rolling resistance, and weight reduction.

Such life-cycle savings can add up to huge sums for owners of fleets with thousands of delivery trucks, such as UPS and FedEx Express. For example, companies with a large package delivery fleet composed of 1,000 class 3 vans, 8,000 class 4 gasoline box trucks, and 8,000 class 4 diesel box trucks could save nearly $300 million over the period of ownership for those vehicles—and considerably more if fuel prices topped $3.50 per gallon. Fleets relying exclusively on the simple two-year payback calculation would not invest in advanced technologies, and would therefore miss out on the substantial savings that these technologies provide.

UPS Embraces Hybrid Delivery Trucks

In April 2010, package delivery giant UPS announced that it was adding 200 new hybrid-electric trucks in eight U.S. cities to its fleet. The company has spent more than $15 million on advanced vehicles.

"By reducing operating costs, advanced efficiency technologies will benefit our industry over the long term," UPS Director of Maintenance and Engineering Robert Hall explained. "We have thousands of trucks, and the fuel savings really add up over the service life of the vehicles in our fleet. Looking at full life-cycle costs and benefits, we believe we will be able to make a business case for these technologies once the incremental costs come down. However, purchase incentives are vitally important for the next several years, until volumes increase and incremental costs come down."

Long-Haul Fleets

Fleets of long-haul trucks—categorized as class 8 vehicles—have even greater potential for efficiency gains and cuts in fuel use. In analyzing the business case for these vehicles, CALSTART analysts found that fleet owners who require drivers to adhere to a 60-mph speed limit and buy vehicles with advanced aerodynamics, tires with low rolling resistance, a hybrid drivetrain, and a bottoming cycle[20]—all of which are technologically feasible by 2020—can increase their fuel economy by 65 percent. For one tractor and two trailers, that package would cost $61,510.[21] That is a significant up-front investment, but lease arrangements can spread the cost over the life of the vehicle, and fleets will realize significant reductions in operating costs.

Fleets that invest in this advanced technology package would save about $120,000 per truck over eight years of service, assuming a fuel price of $3.50. By adopting such a package for all their vehicles, owners of a long-haul fleet composed of 5,000 tractors and 10,000 trailers could save a total of $600 million. Once again, however, owners using the simple two-year payback calculation would not opt for the advanced technology package, because they would not have a complete picture of its true benefits.

Table 2. PER-TRUCK COST SAVINGS FROM ADVANCED TECHNOLOGIES

(LIFE-CYCLE PAYBACK VERSUS INDUSTRY PRACTICE)

FLEET TYPE	TRUCK TYPE	TECHNOLOGY ASSUMPTION	ANALYSIS METHOD	SAVINGS
PACKAGE DELIVERY	Class 4 Box Truck (Gasoline)	• 78% Efficiency Gain • $13,062 Capital Cost	• 2-Year Simple Payback • **Life-cycle Savings** (12-year ownership)	-$3,457 **$26,217**
	Class 4 Box Truck (Diesel)	• 73% Efficiency Gain • $18,242 Capital Cost	• 2-Year Simple Payback • **Life-cycle Savings** (12-year ownership)	-$10,879 **$10,942**
LONG-HAUL FLEET	Class 8 Tractor and Two Trailers	• 65% Efficiency Gain • $61,510 Capital Cost	• 2-Year Simple Payback • **Life-cycle Savings** (8-year ownership)	-$6,358 **$120,096**
CLASS 8 OWNER-OPERATOR	Class 8 Tractor (Purchased New)	• 43% Efficiency Gain • $41,270 Capital Cost	• 2-Year Simple Payback • **Life-cycle Savings** (15-year ownership)	-$13,205 **$88,404**
	Class 8 Tractor (Purchased Used, 5 Years Old)	• 43% Efficiency Gain • $17,639 Capital Cost	• 2-Year Simple Payback • **Life-cycle Savings** (10-year ownership)	**$10,426** **$83,304**

Assumptions: (1) All scenarios assume $3.50/gallon fuel price; (2) two-year simple payback assumes 24 months of fuel savings, with no discounting; (3) the life-cycle payback includes fuel savings over the vehicle's period of ownership, with future fuel savings discounted by 7 percent annually; (4) estimates of capital costs assume a mature market with high-volume manufacturing; (5) costs and savings are presented in year 2009 dollars.

Owner-Operators of Long-Haul Trucks

Independent owner-operators account for a large segment of the tractor-trailer sector. Unlike owners of large fleets, who usually buy new tractors and may own multiple trailers per tractor, these small businesses—often a sole proprietorship—tend to buy used vehicles, and may own only a tractor rather than a tractor and trailer. Owner-operators tend to keep their vehicles in service longer than owners of large fleets, though they usually drive them fewer miles each year.

The CALSTART analysis shows that an owner-operator purchasing a new tractor with a hybrid-electric drivetrain, a bottoming cycle, better aerodynamics, and tires with less rolling resistance could save nearly $90,000 over a 15-year period, given a fuel price of $3.50. An owner-operator who buys a five-year-old tractor and uses it for 10 years would save more than $80,000.

Market Failures and Uncertainties Stall Improvements

Despite the potential for significant fuel and cost savings over the service life of trucks with advanced technologies, many fleet owners and owner-operators are hesitant to embrace them. If truckers are highly sensitive to the bottom line, why are more not demanding fuel-efficiency technologies that can save them money at the pump?

Like the typical consumer, truck owners are risk-averse and operating in an environment of uncertainty. Volatile fuel prices complicate the purchase decisions of fleet owners, as savings are highly dependent on fuel prices, and a drop in the price of diesel could hurt the business case for efficiency investments.

Furthermore, maintenance, durability, and residual value are somewhat uncertain—particularly for newer technologies. Fleet owners are understandably hesitant to invest in technologies that may prove to have high maintenance costs, a short lifetime, or little resale value. Split tractor and trailer ownership, a lack of standardized information on truck fuel economy, short ownership periods, and the absence of performance standards also hinder both the development and adoption of fuel-efficiency technologies.

As a result, many fleet owners take a conservative approach and prefer to invest in new technologies only when they can expect a quick payback. That approach often prevents greater use of even mature technologies such as wide-base tires, which can replace double sets of conventional tires. The two-year standard presents an even more formidable barrier to new technologies such as hybrid drivetrains, which now have high incremental costs because of their low production volumes.

To realize the economic, employment, environmental, and energy security benefits of more advanced truck technologies, the nation needs policies designed to overcome these market barriers. A combination of performance standards and incentives—such as tax credits and grants for vehicle owners who buy advanced technologies—could do the job.

Performance standards would provide the certainty manufacturers need to invest in the development and production of new technologies, and to ensure that they offer fuel-efficient trucks in all categories. Such standards would also help overcome barriers such as split ownership of tractors and trailers and owners' desire for short-term payback. Incentives, meanwhile, would lower the up-front costs of more advanced technologies, until higher production volumes and advances in engineering and manufacturing make them cost-effective even in the short term. The combination would create both a market pull and a regulatory push for technologies that could dramatically improve the fuel efficiency of the nation's trucks.

Conclusion: Investing in Advanced Truck Technologies Pays Big Dividends for America

Accelerating the transition to advanced fuel-efficiency technologies for trucks can enable the United States to seize a valuable strategic opportunity. By drastically reducing fuel consumption, investments in advanced truck technologies would reduce operating costs and produce significant savings for fleet owners while creating and retaining jobs in the industry. Those savings, in turn, would free up capital for purchasing other goods and services, creating tens of thousands of jobs across the country. Advanced truck technologies would also cut global warming pollution and other harmful emissions, and increase the nation's energy security.

However, several market failures and barriers now stand in the way of these gains in efficiency and employment. A comprehensive package of policies that send consistent, positive, long-term market signals are essential to overcoming those barriers. Performance standards—coupled with smart incentives and public investments in the research, development, and demonstration of advanced technologies—would ensure that the nation reaps the powerful economic and environmental benefits of those technologies.

ENDNOTES

1 Federal Highway Administration, Statistics 2008, table VM1. See *http://www.fhwa.dot.gov/policyinformation/statistics/2008/vm1.cfm*.

2 Average on-road fuel economy of medium- and heavy-duty trucks fluctuated between 5.3 and 6.6 mpg from 1970 to 2007 (DOE 2009, tables 5-1 and 5-2).

3 Cleetus, Clemmer, and Friedman 2009.

4 This analysis assumes that diesel fuel costs $3.50 in real terms.

5 This analysis assumes that diesel fuel costs $3.47 in 2020 and $3.40 in 2030.

6 To calculate savings, the report assumed that fuel would cost $3.47 in 2020 and $3.40 in 2030. Investment costs and savings are presented in year 2006 dollars.

7 This total is based on a UCS estimate that the average passenger vehicle emitted 6.7 metric tons of global warming emissions (in CO_2 equivalent) in 2010.

8 Federal Highway Administration, Statistics 2008, table VM1. See *http://www.fhwa.dot.gov/policyinformation/statistics/2008/vm1.cfm.*

9 EPA 2008. This estimate is based on fuel use of trucks in classes 3 through 8.

10 This estimate is based on the U.S. Census Bureau's 2002 Vehicle Inventory and Use Survey of fuel consumption of class 8 combination trucks with primary trip lengths of more than 200 miles.

11 NRC 2010; Cooper et al. 2009. Increasing the quantity of goods each truck carries can also save fuel. Some states allow tractors to haul two or three trailers. Concerns about highway safety and the effect on infrastructure have prevented wider use of such configurations. Should the industry address those concerns, total fuel use could drop on truck routes that can accommodate larger-capacity trailers. However, regulators should consider the impact of any proposed changes in truck weight or length on more fuel-efficient transport modes such as rail and ship.

12 NRC 2010; An et al. 2000.

13 NREL 2009.

14 Tomic 2007; Tomic and Van Amburg 2007.

15 MRG 2010. GDP values are presented in year 2006 dollars.

16 The CALSTART life-cycle cost analysis omitted several variables that would generally improve the economic case for advanced technologies. These include possible tax credits or other purchase incentives, the benefits of a "green" image, and labor savings stemming from reduced refueling. The analysts based the resale value of a vehicle on current rates of depreciation applied to the vehicle's initial price. To the extent that used fuel-efficient trucks would have lower rates of depreciation given their potential fuel savings, this approach would undervalue the life-cycle savings.

17 The Hybrid Truck Users Forum (HTUF) is a national program that focuses on speeding the commercialization of hybrid and high-efficiency truck technologies. HTUF working groups are composed of fleet owners who are early adopters of new technologies that reduce operating costs and decrease emissions. Through these working groups, CALSTART collaborates with more than 80 regional and national fleets representing more than 1 million trucks on the road. The working groups have led directly to vehicle procurement, assessment, and launched production of several classes of trucks, including utility, refuse, food delivery, and heavy regional.

18 For more results and sensitivity analyses, see CALSTART 2010.

19 These results assume fuel prices of $3.50 per gallon. See CALSTART 2010 for more detail.

20 A bottoming cycle is an advanced waste-heat recovery technology described in Cooper et al. 2009.

21 Per-truck technology costs, including up-front capital costs as well as operations and maintenance costs, are from Cooper et al. 2009.

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The Union of Concerned Scientists (UCS) is the leading science-based nonprofit working for a healthy environment and a safer world. UCS combines independent scientific research and citizen action to develop innovative, practical solutions and to secure responsible changes in government policy, corporate practices, and consumer choices.

More information about UCS and the Clean Vehicles Program is available on the UCS website at *www.ucsusa.org/clean_vehicles*.

CALSTART is a member-supported nonprofit organization dedicated to expanding and supporting a high-tech clean transportation industry that cleans the air, creates jobs and economic opportunities, reduces greenhouse gas emissions, and secures our transportation energy future.

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However, despite the cost-effectiveness of truck fuel-efficiency technologies, market barriers have prevented their widespread adoption. This report shows that policies such as performance standards and incentives designed to overcome these barriers could deliver powerful economic and environmental benefits across the nation.

The Union of Concerned Scientists is the leading science-based nonprofit organization working for a healthy environment and a safer world.
This report is available on the UCS website at ***www.ucsusa.org/deliveringjobs***.

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