



ANNUAL FLEET FUEL STUDY

The Annual Fleet Fuel Study (AFFS) contains the results of a deep-dive investigation into the adoption of various products and practices for improving freight efficiency among 24 major North American fleets. Fleets share with North American Council for Freight Efficiency (NACFE) their purchase and use of 86 technologies going back to 2003.

By this report, completed in 2022, NACFE has accumulated data on the purchasing habits of 24 fleets. To be included in this data set, fleets provided data on the tractors and trailers for which they specified the features (technologies) and purchased the fuel for the tractors. This makes for a clean data set for comparing the fuel efficiency to the adoption decisions.

The fleets have been very consistent in providing data for this report, but over the years, some fleets continue to participate, others elect not to and are replaced by others. NACFE keeps each fleet's data in the data set and makes note where any particulate fleet's participation or lack thereof affected the results in a meaningful way. For

2022, 15 fleets provided data for their 2019, 2020 and 2021 operations. In total, 24 fleets have provided data over the 11 years of the study.

NACFE would like to thank the participating fleets for offering such important information to the rest of the industry. This study provides a benchmarking opportunity for participating fleets to continue to improve their operations and increase freight efficiency. If you are interested in joining this study, please contact NACFE at mike.roeth@nacfe.org. For other fleets the details in this study will provide a roadmap for your consideration of technologies and practices to help reduce fuel costs.

ACKNOWLEDGMENTS

NACFE Report Team:

Mike Roeth, Executive Director, NACFE
Yunsu Park, Director, Engineering, NACFE
David Schaller, Director, Industry Engagement, NACFE
Denise Rondini, Director, Communications, NACFE
Kim Ehrenhaft, Design Director, NACFE

© 2022 North American Council for Freight Efficiency. All rights reserved. The contents of this document are provided for informational purposes only and do not constitute an endorsement of any product, service, industry practice, service provider, manufacturer, or manufacturing process. Nothing contained herein is intended to constitute legal, tax, or accounting advice, and NACFE assumes no liability for use of the report contents. No portion of this report or accompanying materials may be copied, reproduced, or distributed in any manner without express attribution to the North American Council for Freight Efficiency.



2022 FISCAL SUPPORT



Platinum



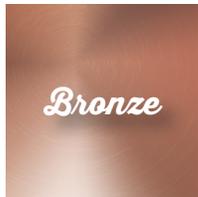
Philanthropy



Gold



Silver

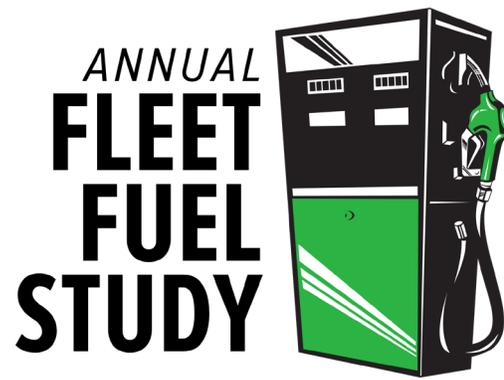


Bronze



“The goal of NACFE’s Annual Fleet Fuel Study is to increase the adoption of fuel saving technologies across the trucking industry.”

— Mike Reoth, executive director, NACFE



About NACFE's Annual Fleet Fuel Study

This is the ninth update of the North American Council for Freight Efficiency's (NACFE) 2012 inaugural study that has been described as an important read for anyone working in this area. Fifteen fleets have supplied data for this 2022 report. NACFE paused the study for three years given industry attention to an extraordinary set of circumstances, most significantly the COVID-19 pandemic. This report incorporates technology adoption and efficiency that now includes data from 2019, 2020 and 2021.

"While it made sense for NACFE to delay gathering data for this report, I am excited it's back because it is an important tool for fleets that are looking to operate in a more fuel-efficient manner. I look forward to this report and read it each year within days of it being published. It is important to Schneider's efforts, and it can be a critical resource to any fleet or owner/operator as well as manufacturers and others who are working to improve Class 8 efficiency," offers Rob Reich, chief administrative officer, Schneider.

The findings of this report should prove invaluable to efforts both to improve the fuel economy of a fleet and to develop and deliver fuel efficiency products to the marketplace.

The scope of this work encompassed Class 8 tractors (day cabs and sleepers) and trailers in regional and long-haul applications. Fleets providing data for this 2022 study include:

CFI	PAPER TRANSPORT
C.R. ENGLAND	PILOT FLYING J
FRITO-LAY	PITT OHIO
J.B. HUNT	SCHNEIDER
MAVERICK TRANSPORTATION	UPS
MESILLA VALLEY TRANSPORTATION	U.S. XPRESS
NFI	WERNER ENTERPRISES
NUSSBAUM TRANSPORTATION	

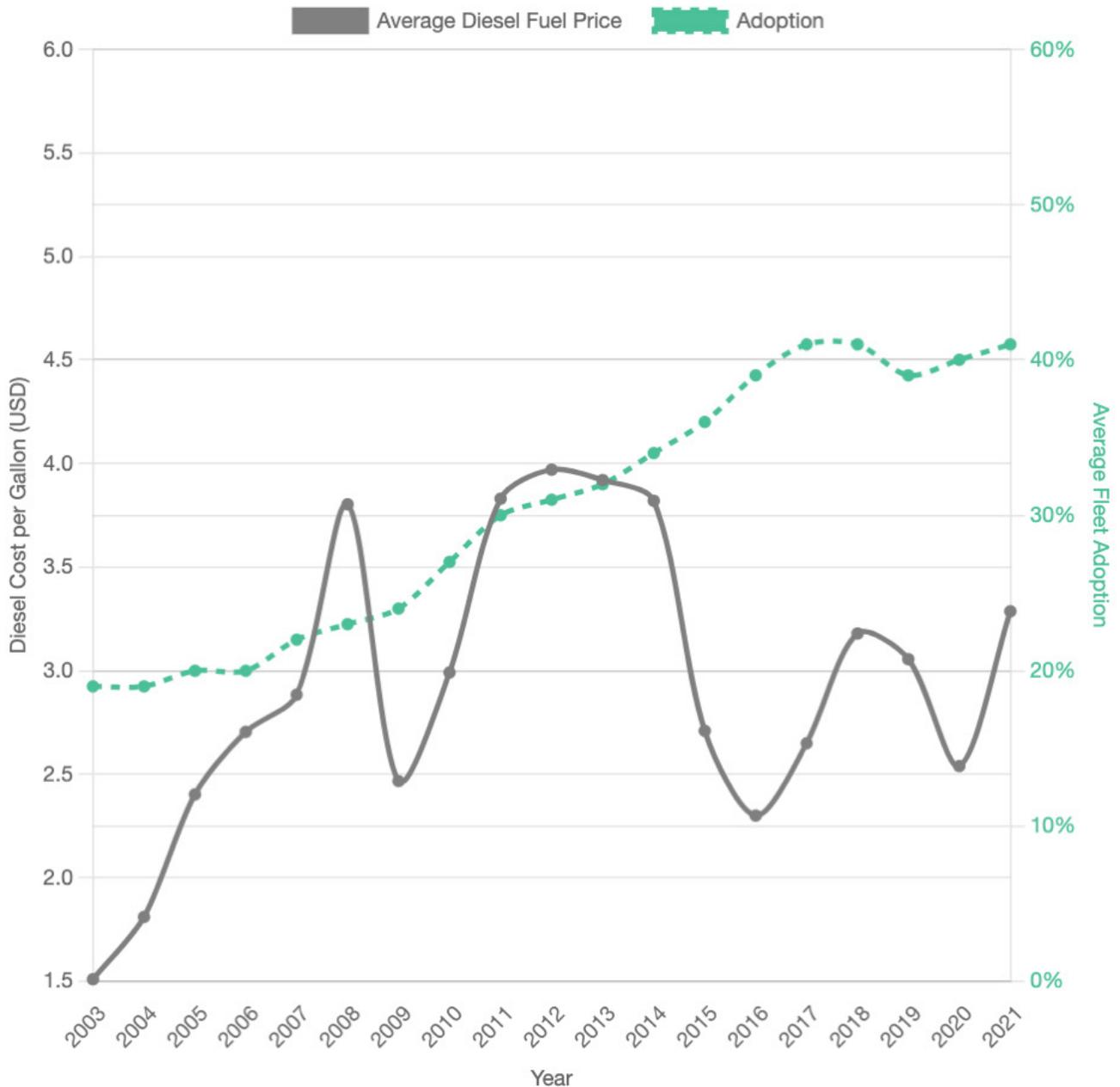
The primary goal of the report is to study the fleets' levels of adoption of 86 technologies and practices, and the savings those drove in each organization. All 86 technologies are currently available and not prototypes, validation test units, or pre-production units. This study focuses on technologies purchased and implemented onto a fleet's trucks and trailers. In certain cases, fleets were asked if they had retrofitted any of the devices on their equipment, but this was done for context and is not included in the adoption data.

Report Findings

The primary finding of this report is that the 15 fleets studied are increasing their rate of adoption of these technologies, and that they are enjoying improved fuel economy as a result. The overall adoption rate for the technologies studied in this report has grown from 17% in 2003 to 41% in 2021. Not all technologies could be applied to a single tractor-trailer, as some are clearly

an either/or decision. 2021 showed an increase in fuel cost at the pump with diesel fuel, which powers a large majority of this fleet, averaging \$3.29 per gallon for 2021 (EIA, 2022), up from \$2.54 in 2020. This is a 30% increase year over year and a \$0.99 per gallon increase from 2016 (when fuel prices were at their lowest since 2004). The five-year average is \$2.94, meaning that fuel costs annualized in 2021 were within \$0.34 of that level (See Figure ES1).

FIGURE ES1
PRICE OF DIESEL AND NACFE FLEETS ADOPTION



The average fleet-wide fuel economy of the trucks in this study was 7.23 mpg in 2021 — a slight increase from the 7.15 in 2017. There is variability in each fleet’s yearly fuel efficiency depending on many factors, but overall, these fleets had a very impressive average rate of improvement in MPG of 2.0% from 2011 to 2017.

the 15 fleets not purchased the technologies that are available to them as options.

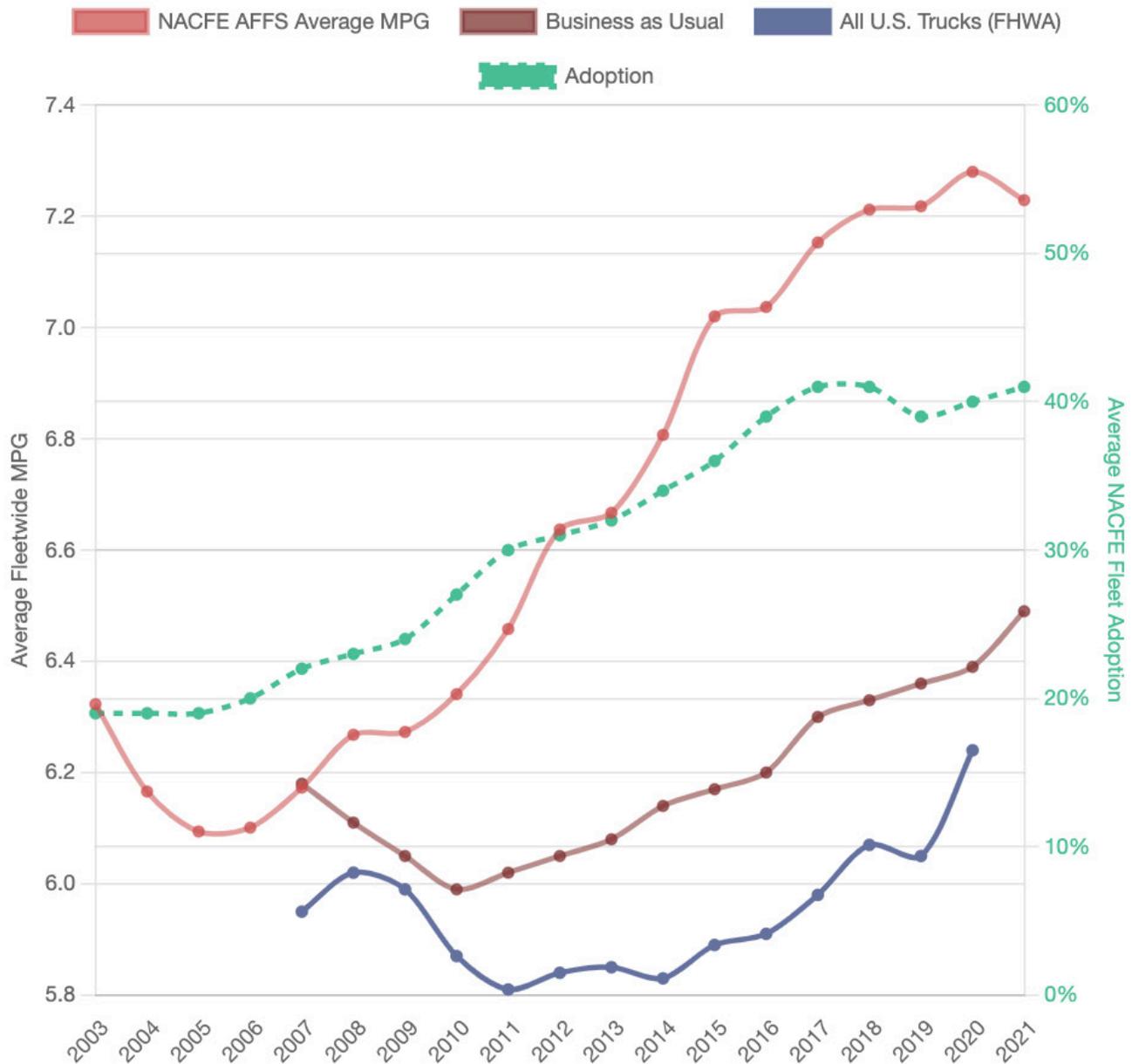
Figure ES2 shows the average fleet-wide fuel economy for the combined population of trucks in this study compared to the overall U.S. truck population. A business-as-usual (BAU) line is included for comparison. The BAU shows a projection of what average MPG might have been given the combined impact of 2002, 2007, and 2010 emission regulations, and the effect of the 2014 and 2017 Greenhouse Gas (GHG) base powertrain improvements. In other words, this suggests the level of efficiency had

The national average for the approximately 1.7 million tractors in over-the-road use is shown and was obtained using International Fuel Tax Reporting data from the Federal Highway Administration (FHWA, 2019). Of note this year is that the national average of these trucks jumped to 6.24 MPG in 2020, a reflection of the fact that the MPG increases over the last 10 years are starting to be reflected in the overall population’s efficiency. As of the finalization of this report, 2021 data was not yet available.

During NACFE’s Run on Less demonstration in September of 2017, the tractor-trailers equipped with the best of the best currently available technologies attained 10.1 MPG.

FIGURE ES2

AVERAGE FLEET-WIDE FUEL ECONOMY OVER TIME





METHODOLOGY

This report's conclusions were generated through input provided by a total of 24 fleets beginning in 2012. Fleets were asked to fill out a questionnaire about their use of 86 fuel-efficiency technologies and practices for their tractors and trailers.

Over the course of the years of the study, some fleets have dropped out, while others have been added. For the 2022 study, 15 fleets provided data covering their 2019, 2020 and 2021 operations.

And in October 2019, the group conducted a second Run on Less where the average for the more demanding regional haul duty cycles reached 8.3 MPG.

The fuel savings in 2021 between the BAU of 6.49 MPG and the NACFE fleets' average of 7.23 MPG amounts to \$5,178 per year per truck, at the \$3.29 per gallon fuel cost over the average tractor mileage of 100,000. The fleets are saving \$7,207 over the national average of 6.24 MPG. If fuel costs had been at the five-year average of \$2.94 per gallon, the savings would have been \$4,635 and \$6,452, respectively. And finally, the 15 fleets operating

75,000 trucks saved over \$540,000 in 2021 compared to the average trucks on the road.

Results Reflect Growth of Technology Use

The results of the AFS clearly reflect a growing use of fuel-saving technologies and practices and 2022 provided another interesting set of data. Following are the high-level conclusions reached by the study team this year.

Study fleet-wide fuel efficiency stalled from 2018 to 2021. After an average year-over-year increase of 2% from 2011 through 2017, fleet-wide average from these benchmark fleets was flat at 7.24 MPG from 2018 through 2021. NACFE received input from the participating fleets and other fleets, OEMs and manufacturers as well as other groups and determined this was caused by the following factors:

- Many fleets have increased their cruise and pedal highway speeds. In fact, fleets with maximum speed limiters under 65 MPH have declined from 80% in 2016 to 62% in 2021. This results in a significant increase in fuel consumption with a 0.1 MPG hit for every 1 MPH increase in average speed.
- Fleets have been keeping trucks longer, but truck builders have been bringing better MPG trucks to the market each model year. This decreases the number of new more fuel efficient trucks in the study.
- GHG phase 2 regulations have required manufacturers to bring improved base engine and truck MPG, particularly in 2017 and 2021 when compliance steps were required. But, the fleets in the study have slightly decreased their adoption of optional fuel-efficiency features.
- Anecdotally several fleets have told NACFE that their idle times have increased in recent years. Drivers spent more time in their bunks or waiting at shipper's and receiver's docks. This, combined with a reduction in the adoption of battery HVACs and diesel APUs contribute to an overall decline in MPG.



“Improving fuel economy doesn’t always grab the headlines, but it adds up to real results. Cummins estimates that the 100,000 internal combustion engines that are each 10% more efficient are equivalent to the improvement gained by putting 10,000 zero-emission vehicles on the road.”

— Jennifer Rumsey, CEO, Cummins, Inc.

- A few new fleets with lower levels of aerodynamics adoption replaced some other fleets that had higher adoption rates and efficiency. This was a function of the fact that some regional haul fleets replaced long-haul fleets in this year’s AFFS and traditionally regional fleets install fewer aerodynamic devices.
- All heavy-duty tractors in the United States have improved efficiency in the past few years. For all Class 8 tractor-trailers, the national MPG average has increased rather sharply in the last three years from 5.98 MPG to 6.24 MPG. As the higher MPG delivered by model year 2010 to 2018 trucks have found their way into replacing older trucks, the average is increasing. Tractor life is generally in the 10 to 15 year range, so trucks being bought in the five-year replacement cycle can have an MPG increase of one to two MPG.
- Sustainability has become a large driver for fleets to decarbonize the way they move goods. Corporations are responding to an increased demand by their shipping customers and the general public to move goods more sustainably. The industry is not waiting for zero-emission solutions to do this, as improving freight efficiency on diesel tractor-trailers is a key decarbonization strategy that saves emissions now. Decarbonization does not mean only a move to zero-emissions freight movement. Improving MPG of diesel tractors and trailers with these technologies is a clear effort to burn less fuel and reduce carbon emissions.
- Regulations will drive freight efficiency through the next two decades. The GHG phase 2 regulations have steps for the OEMs to comply with in Model Years 2024 and 2027 and a GHG phase 3 is being studied by the EPA and NHTSA, for implementation next decade. These are significant MPG improvements that will have OEMs develop, offer and sell new features on their tractors and trailers that will show up in this study in future years.

NEW BENCHMARKING TOOL

New for the Annual Fleet Fuel Study (AFFS) for 2022 is an online version of the technology benchmarking tool. Users have the ability to complete their benchmarking online for each technology category in which they are interested or for all 86 technologies. They then receive a customized interactive report report which includes the user’s responses prioritized by the technologies that have the greatest gap between the user and the average of the AFFS fleets. By using the interactive tool, fleets also contribute to the growing database of technology adoption data. There is no cost to use this tool.



The interactive benchmarking tool replaces the previous Excel-based version. Each technology, grouped by category, is listed with the average adoption rate for all fleets in the most recent survey and a color bar indicating the proportion of fleets that have explored the technology and the rate at which they have adopted it. A technology which has the color bar completely filled in has been explored by all fleets in the survey. An all green bar indicates that all fleets that have explored the technology have adopted it in 100% of their new trucks. A technology which is showing a wide red bar would indicate that many fleets have explored the technology but have stopped using it. Some technologies have some green and some red in the adoption rate bar, which could indicate that the technology is suitable to some applications or duty cycles and not others.



WEBSITE UPDATES

In conjunction with the release of the Annual Fleet Fuel Study (AFFS), NACFE is updating its website. NACFE has issued Confidence Reports on nearly all of the 86 technologies in the AFFS. The website has been updated to more closely link the AFFS to the Confidence Reports where fleets can find more in-depth information on a technology they are considering adopting based on what they learned in the AFFS.

Recommendations

Our goal is for the information shared in this study to provide other fleets a roadmap for navigating the many available technologies that can have a positive impact on lowering fuel expenses. A benchmarking tool is being released with this study that can be used by any truck owner to compare his or her own technology adoption to that of the fleets in this study. Also, technology developers and manufacturers can use this data to improve the total cost of ownership of their products. The package of information released includes this full report, a full set of

graphics, and the data set and benchmarking tool. We expect it will be helpful in your efforts.

Here are some recommendations to help fleets operate more efficiently.

1. Collect and monitor fuel consumption by vehicle. Fleet MPG improves vehicle by vehicle. Tracking fuel consumption by vehicle also allows a fleet to understand which duty cycles and applications are best for fuel efficiency, identify pieces of equipment that need to be maintained or replaced and reward or re-train drivers that may be over- or under-performing.
 - Set long-term MPG improvement goals. Many fuel-saving technologies have a high return on investment which will improve the profitability of a fleet.
 - Use the Annual Fleet Fuel Study benchmarking tool to identify technologies to test.
 - Continuously track your progress
2. Commit to and budget for an ongoing plan of MPG improvement.
3. If possible, develop a test route and test driver with which to test new technologies. This can be a purpose-made route or an ongoing dedicated route where MPGs are fairly consistent.
4. If purchasing used equipment, purchase equipment from fleets known for having good fuel economy. These fleets are continually testing technologies and are adopting ones that are successful.
5. Allow for failure. Not all technologies will be right for your application and duty cycle. Do not let short-term failures derail your long-term goals.

Improving your efficiency through adoption of these technologies will improve the range when you decide to move forward with alternative fueled powertrains such as battery electric.



“While it made sense for NACFE to delay gathering data for this report, I am excited it’s back because it is an important tool for fleets that are looking to operate in a more fuel-efficient manner.”

— Rob Reich, chief administrative officer, Schneider



ABOUT NACFE

The North American Council for Freight Efficiency (NACFE) works to drive the development and adoption of efficiency enhancing, environmentally beneficial, and cost-effective technologies, services, and operational practices in the movement of goods across North America. NACFE provides independent, unbiased research, including Confidence Reports on available technologies and Guidance Reports on emerging ones, which highlight the benefits and consequences of each, and deliver decision-making tools for fleets, manufacturers, and others. NACFE partners with RMI on a variety of projects including the Run on Less demonstration series, electric trucks, emissions reductions, and low-carbon supply chains. Visit NACFE.org or follow us on Twitter [@NACFE_Freight](https://twitter.com/NACFE_Freight).



ABOUT RUN ON LESS BY NACFE

Run on Less 2017 was a first-of-its-kind fuel efficiency roadshow that proved 10 MPG is possible with various combinations of commercially available technologies. Seven participating fleets hauled real freight on real routes during the three-week run across North America.

Run on Less Regional was conducted in October of 2019. Ten participating fleets demonstrated a variety of commercially available freight efficiency technologies in the three-week cross-country roadshow, proving that 8.3. MPG is possible in regional haul.

Run on Less – Electric was the first NACFE demonstration to focus on electric vehicles. Thirteen fleet-OEM pairs in the US and Canada participated in the three-week long event. If all US and Canadian medium- and heavy-duty trucks in the market segments — vans and step vans, medium-duty box trucks, terminal tractors and heavy-duty regional haul — studied in the Run became electric, about 100 million metric tons of CO₂ would be saved from entering the atmosphere. Visit runonless.com or follow us on Twitter [@RunOnLess](https://twitter.com/RunOnLess).

GET INVOLVED

NACFE could use the assistance of fleets, manufacturers and other trucking industry stakeholders in improving freight efficiency. Become a part of this exciting opportunity.

Learn more at www.nacfe.org or contact Mike Roeth at mike.roeth@nacfe.org