OOIDA Foundation

RESEARCH · SAFETY · ECONOMICS

WHITE PAPER

EPA/NHTSA Phase 2:

Concerns for the Owner-Operator

3/4/2014

Table of Contents

Introduction

On May 21, 2010, President Barak Obama signed a Presidential Memorandum directing the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Transportation (DOT) to develop the first-ever standards for increasing fuel efficiency and decreasing greenhouse gases (GHG) from medium- and heavy-duty trucks for Model Years 2014-2018. The first Phase of the new truck standards was projected to save 530 million barrels of oil, reduce CO_2 emissions by 270 million metric tons, and save vehicle owners operators $50 billion in fuel costs over the lifetimes of the vehicles covered. However, four years later, the EPA/NHTSA Phase 1 regulation has yet to take effect.

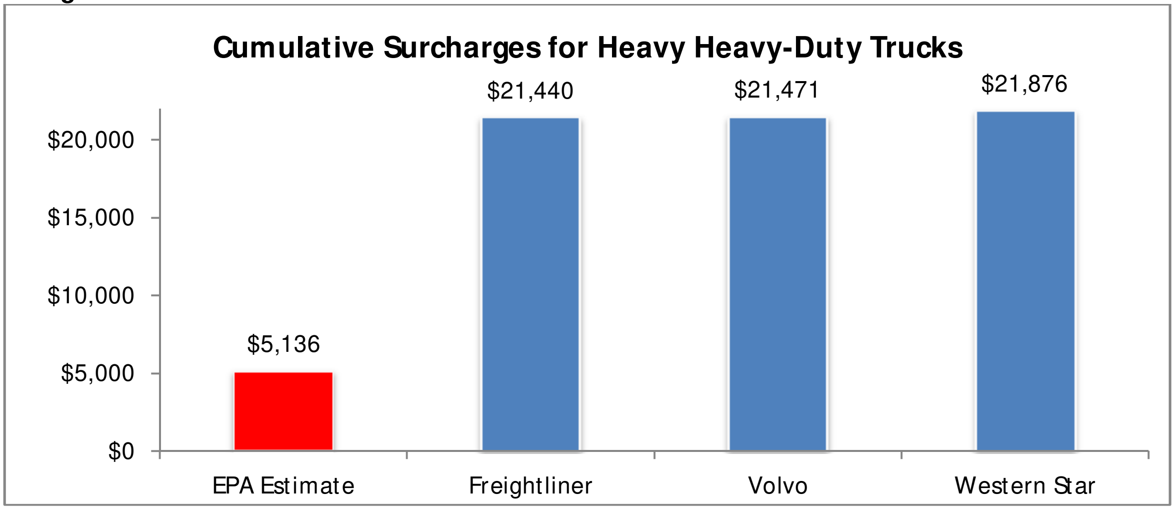
In February 2014, President Obama directed the EPA and the DOT's National Highway Traffic Safety Administration (NHTSA) to create the next phase of medium- and heavy-duty vehicle fuel efficiency and GHG standards, which are estimated to take effect March 31, 2016. In order to develop the next stage of standards, EPA and NHTSA are tasked to work closely with the California Air Resources Board (CARB) and other stakeholders. In developing the second round of standards, the two agencies will consider and assess advanced technologies. Nonetheless, OOIDA desires to bring to light the concerns and issues that the small business owner-operator has with these technologies, and to make sure their voice is heard during the developing of the next Phase of fuel efficiency and GHG regulations.

The following is a list of technologies that the EPA and NHTSA will consider, and the concerns the owner-operators have with these technologies.

Engine and Powertrain Efficiency Improvements

For the past decade, the trucking industry has been flooded with emission reduction regulations including EPA 2007, EPA 2010, Onboard Diagnostic (OBD) in 2013, GHG14, OBD in 2016, and GHG17. The rapid succession of regulations has not given the manufactures time to work to reduce the costs of new vehicles, therefore, these forced regulations will dramatically increase the cost of medium- and heavy-duty trucks. A study published in 2012, entitled "A Look Back at EPA's Cost and Other Impact Projections For MY 2004-2010 Heavy-Duty Truck Emissions Standards," detailed EPA's significant underestimation of real-world vehicle costs.

EPA Projection of Total MY 2004-2010 Heavy Heavy-Duty Compliance Costs Compared to Actual Total Surcharges for Three OEMs



According to the OOIDA Foundation, which conducts annual surveys of its members, the average owner-operator receives a net income of approximately $50,000 per year. As small business owners, owner-operators are not able to afford the significant increases in costs of a new vehicle.

Further, the decreased reliability of EPA compliant truck and engine models has been well documented. A 2011 J.D. Power and Associates study suggested that, "With the new technology required to meet emissions standards, today's engines simply are more problematic than the previous generation. So, while it's possible that manufactures can continue to improve the quality of the engines, it's unlikely that they'll quickly get back to the pre-2004 levels.[1]" In addition, Daimler Trucks North America has stated that vehicle efficiency improvements reduce real-world NO_x emission benefits in proportion to power demand reduction. The combustion fundamentals state that any increase in stringency of NO_x standards will comprise the ability to optimize for minimum CO_2 emissions and maximum fuel efficiency.

Aerodynamics

"Aerodynamic technologies" means components designed to reduce wind resistance on the tractor or trailer resulting in improved overall tractor fuel economy and reduced carbon dioxide emissions. The types of aerodynamic technologies are trailer side skirts (sometimes-called belly fairings), front fairings, rear fairings, strakes, traps, and others.[2] "Fairing" means a structure with smoothly contoured solid surfaces that reduces the wind resistance of the objects it covers.

Trailer side skirts are fairings that extend down from the bottom of the trailer to cover part of the open space between the tractor and the rear trailer wheels. They can be equipped on dry-vans and

[1] CCJ Staff, "J.D. Power, Heavy-duty Engine Quality, Satisfaction Up Since Last Year," Commercial Carrier Journal (2011) http://www.ccjdigital.com/j-d-power-heavy-duty-engine-quality-satisfaction-up-since-last-year/

[2] *Initial Statement of Reasons: Proposed Regulation to Reduce Greenhouse Gas Emissions from Heavy-Duty Vehicles*, CARB (December 2008), pg. 33.

refrigerated-vans. The fuel savings are estimated between 4 and 7 percent. A set of side skirts weigh between 150 and 350 pounds on average depending on the material, length, and configuration of the skirt. Installation time is estimated at 3 to 6 hours.[3] The retail cost to purchase a single set of trailer side skirts ranges between $1,000 and $2,600, which does not include installation. The cost to replace a panel varies from $80 to $500.

Front trailer fairings are curved structures that attach to the front facing surface of a trailer that covers all or part of the trailer's front facing surface. These devices serve to reduce the wind resistance caused by the gap between the tractor and the trailer and allow for smooth, uninterrupted air flow, regardless of the angle of approaching wind. However, they are most effective when installed on tractor-trailers with a gap greater than 36 inches. Front fairings are designed for dry-vans but not refrigerated-vans. The fuel savings are estimated at 1 to 2 percent, and they typically weigh between 75 and 140 pounds.[4] The retail costs for front trailer fairings ranged between $800 and $1,000.

Rear trailer fairings are structures that attach to the outer edges of the trailer's rear-facing surface to provide a continuous surface for the air passing over the side and top surfaces of the trailer. These fairings reduce turbulence and resistance by reducing "suction" on the rear of the trailer. They can be used on both dry-vans and refrigerated-vans. The fuels savings are projected between 1 and 5.1 percent,[5] while the cost is approximately $2,000.

Table 1: Cost Benefit of Aerodynamic Technology

Aerodynamic Technology	Initial Cost	Weight	Estimated Fuel Savings
Side Skirts	$1,000-$2,600	150-350 pounds	4%-7%
Front Gap Fairings	$800-$1,000	75-140 pounds	1%-2%
Rear Fairings	$2,000	75 pounds	1%-5.1%
Grand Total	**$3,800-$5,600**	**300-565 pounds**	**6%-14.1%**

The costs detailed above do not take into account annual maintenance costs, which are projected to be almost $300 annually, or the additional cost of the truck because of the engine and powertrain efficiency improvements. It is important to note that some owner-operators own more than just one trailer, and haul different types of cargo that utilize different trailers, such as flatbeds and dry-vans. Overall, the current trailer to truck ratio is approximately 2.8. Therefore, you can expect these costs to double.

In addition, another problem arises when tractor-trailers are installed with multiple aerodynamic technologies. It should be understood that whenever an aerodynamic device is used, the benefit of the other devices will be effected. This is called the law of diminishing returns. For an example, installing a gap fairing will affect the aerodynamic drag of the side skirts. Therefore, the benefits gained by combining aerodynamic technologies cannot be summed by adding the individual estimated fuel

[3] Ibid, pg. 50.
[4] Ibid, pg. 52.
[5] Ibid, pg. 54.

savings. Combining all the aerodynamic devices listed in the table above will not result in a grand total of 6 to 14 percent fuel savings.

A crucial concern for owner-operators about aerodynamic technologies is the diverse nature of the trucking industry, which differs from the type of trailer and goods hauled to the geographic area of operations. The benefits of aerodynamic technology fluctuate greatly depending on the trailer type and cargo. For instance, as stated above, front trailer fairings are not designed for refrigerated-vans, and are most effective when installed on tractor-trailers with a gap greater than 36 inches.

While aerodynamic technologies sound good academically, they often do not make sense in the real world. Trucking is not a cookie-cutter industry, and in some instances aerodynamic technology can actually cost fuel rather than save fuel. For an example, a sleeper cab tractor with a full-height air deflector that is pulling a flatbed trailer will decrease fuel efficiency because the high roof sleeper increases the frontal area of the truck beyond what the trailer requires.[6]

Further, trucking operations not only vary by types of cargo, but also by geographic region and length of haul, which greatly affects the benefits of aerodynamic technology. Truck drivers in costal and urban areas run very different routes than those who operate on the great plains of the Midwest. Short-haul operations primarily use day cab tractors, which constitute approximately one-third of Class 8 trucks. So far it has not been possible to match the aerodynamic performance of the best sleeper cab models with day cabs.[7]

In an article published in the *Brow Beat*, Susan King, a spokesperson for the American Trucking Associations, stated that aerodynamic technology does not make sense for every truck. The drag on a vehicle increases with the square velocity, so reducing drag becomes much, much more important as the average speed of a truck increases. Ms. King pointed out that this technology does not start to be effective until the truck is averaging 60 to 65 mph. "So you wouldn't see these panels on trucks that handle local deliveries.[8]"

Therefore, unless an owner-operator is running long haul where they average 60 to 65 mph, these aerodynamic technologies would have little effect on fuel savings, and it would be difficult for owner-operators to see a return-on-investment. For an example, in California the speed limit for heavy-duty vehicles is 55 mph, thus these technologies would not be able to reach their maximum effect.

Weight Reduction

The average owner-operator receives approximately 6 miles per gallon in their commercial motor vehicle. In the academic world, the idea of reducing the vehicle weight sounds like a good way to tackle fuel inefficiency in CMVs. However, this is a frightening concept for a truck driver. The goal of better

[6] *Technologies and Approaches to Reducing the Fuel Consumption of Medium- and Heavy-Duty Vehicles*, National Academies Press (2010), pg. 98.
[7] Ibid.
[8] Mark Vanhoenacker, "What's That Thing? Truck Fins Edition," Slate Magazine (2013), http://www.slate.com/blogs/browbeat/2013/04/03/truck_panels_what_do_they_do_explained_photos.html

fuel efficiency is a noble one, but it is not worth the expense of a weaker and lighter cab. Currently, the United States does not have any cab crashworthiness standards for vehicles with a gross vehicle weight rating over 10,000 pounds. OOIDA has urged NHTSA to develop such standards.

In 2009, Carl VanWasshnova, an OOIDA member from Port Orange, FL, was killed in a low-speed crash after his day cab collapsed around him. According to the Federal Motor Carrier Safety Administration, approximately 700 truck drivers have died annually in the past 10 years from single or multi-vehicle crashes. Accidents involving truck rollovers are among the most deadly as they account for approximately 63 percent of fatal injuries to truck occupants. While millions are being spent to develop new technologies, basic and common sense features such as air bags and truck cab crashworthiness are being left behind.

In response to a 20 percent increase of truck occupant deaths in 2011, OOIDA released a statement saying, "What is wrong with this picture? NASCAR drivers walk away from collisions at 200 miles per hour but truck drivers are losing their lives at 30 miles per hour. Families are being destroyed because we are making cabs lighter and lighter while efforts persist to make the loads heavier. Accidents will happen – period. We won't be able to outsmart that.[9]" Reducing the weight of CMVs in order to improve fuel efficiency should not be a compromise for safety.

Improved Tire Rolling Resistance

Low-rolling-resistance (LRR) tires are designed to improve fuel efficiency of a tractor pulling a trailer by minimizing its rolling resistance, which consists of energy lost as heat within the rubber itself, as well as aerodynamic drag of the tire, and friction between the tire and the road and between the tire and the rim when the tire is rolling under load; rolling resistance is expressed as the energy consumed per unit distance as the tire rolls under load.[10]

According to the EPA SmartWay program, for every 5 percent reduction in tire rolling resistance, a 1 percent reduction in fuel savings might be attained. Tests have confirmed that most LRR tires have a long stopping distance at high speeds and lack grip in the corners, both of which could ultimately lead to an accident.[11] Sheldon Brown, an executive program manager at the Toyota Technical Center, has said, "There have been significant trade-offs with this type of tire, namely wear performance and stopping distance.[12]"

Regardless of the higher cost of LLR tires and the concerns of its effectiveness in fuel savings, the tire is not designed for all types of operations. An owner-operator running routes in mountainous terrain does

[9] Jami Jones, "Truck occupant fatalities up 20 percent," *Land Line Magazine* (2012), http://www.landlinemag.com/Story.aspx?StoryId=24533

[10] *Final Regulation Order: Tractor-Trailer Greenhouse Gas Regulation*, CARB (2011) pg. 5.

[11] Eric Loveday, "Range-Increasing Low-Rolling Resistance Tires Falling Out of Favor with Drivers," Inside EVs, http://insideevs.com/range-increasing-low-rolling-resistance-tires-falling-out-of-favor-with-drivers/

[12] Stuart F. Brown, "More Traction for Fuel-Efficient Tires," *The New York Times* (2013), http://www.nytimes.com/2013/02/17/automobiles/more-traction-for-fuel-efficient-tires.html?_r=0

not want a tire that has less friction and less traction equipped on their tractor-trailer, especially while driving in extreme weather conditions. The LRR tire may be beneficial on flat terrain, but it is a safety concern in many geographical regions. Steven Bixler, an OOIDA Board Member, stated "Asking me to run LRR's would be like asking someone to walk up and down Lombard Street in San Francisco in a pair of smooth soled penny loafers on an inch of ice."

By the very nature of their job, truckers must be prepared for just about any possible situation at all times, whether it is foreseeable or not. In the course of a single day, a truck driver can be faced with many varying situations and scenarios, and a large part of being properly prepared is choosing the right equipment and accessories for a job that can change as quickly as the weather. Understanding this fact is vital because making a poor equipment choice can have dire consequences. The tires on a tractor-trailer are not only a significant financial investment, but can be the difference between safely completing a trip, or not. A LRR tire achieves much of its potential fuel savings benefit by reducing the very component of friction or resistance that a truck driver needs to have faith in, which is not an option for many owner-operators.

When a truck driver is navigating a curve, static friction is the main force that keeps the truck on the pavement. If an owner-operator is running a route over a mountain pass such as California's Interstate 5, which is infamously known as the unforgiving Grapevine, they need to have the proper tire equipped. The Grapevine is part of the Tejon Pass located in the Tehachapi Mountains. The peak reaches over 4,100 feet and has a steep grade of up to 6 percent. In addition, on any given day a driver may encounter conditions such as rain, snow, ice, fog, and condensation. If the static friction is reduced, the driver has a much greater possibility of encountering kinetic friction, or in other words a skid, which may result in a crash.

For another example, the Eisenhower-Johnson Memorial Tunnel in Colorado is one of the highest vehicular tunnels in the world with a maximum elevation of 11,158 ft. However, if an owner-operator is transporting hazardous materials, they are not allowed to use the tunnel. Instead, the driver must travel on top of the mountain across Loveland Pass, which is almost another 1,000 ft higher. For the two routes mentioned, LRR tires are simply not an option. The small fuel saving benefit associated with LRR tires is greatly outweighed by the potential loss of friction that may cause an accident.

Hybridization

Applying hybrid drivetrain technology to medium- and heavy-duty vehicles is estimated to improve fuel economy by 20 to 50 percent, as well as reduce GHG emissions. The CO_2 emission reductions with hybrid trucks are projected to be much more significant than those for passenger hybrids. Nevertheless, despite the possible benefits, the hybrid truck industry is at an early stage. Hybridizing large vehicles poses complex technical challenges because commercial trucks must carry tremendous weight, operate in near continuous use, make many stops and starts, and often perform tasks not demanded of passenger vehicles. The introduction of hybrid commercial trucks to the market is about 10 years behind passenger hybrids. Only 5,000 hybrid commercial trucks were produced in 2010.[13]

The technology and production of hybrid commercial trucks is not widely available yet even to large fleet motor carriers, let alone one-truck owner-operators. Likewise, the infrastructure for hybrid trucks is not in place, which makes the task of hybridization extremely difficult, especially considering the time restraints of Phase 2. Further, the cost of hybrid vehicles would be far out-of-reach for the majority of owner-operators.

Alternative Fuels

Liquefied petroleum gas (LPG), also known as propane, is a clean-burning fossil fuel that can be used as an alternative fuel source to power light, medium, and heavy-duty vehicles (HDVs). LPG is a by-product of natural gas processing and crude oil refining. It is a liquid mixture of 90% propane and assorted gases including ethane, butane, and propylene. LPG does have some advantages, such as its domestic availability, high energy density, clean-burning fuel qualities, and its relatively low cost.

However, LPG does have a lower British thermal unit (Btu) rating than gasoline, so it takes more fuel to drive the same distance.[14] The driving range of a propane vehicle is about 14% lower than a comparable gasoline-powered vehicle.

Further, other drawbacks to LPG include troubles with the engines starting in cold temperatures, the possibility of a boiling liquid expanding vapor explosion when LPG tanks are exposed to and enveloped by fire, the cost of LPG vehicles ($16,500 more than a new diesel powered vehicle), the cost to convert diesel vehicles to propane by using qualified system retrofitters ($13,000 for a medium-duty vehicle and $20,000 for a heavy-duty vehicle), and the weight and size of the tanks. The single tanks range from 12 to 24 inches in diameter, 34 to 80 inches in length, and 70 to 370 lbs in weight, with an additional 24 to 64 lbs for the brackets holding the tanks.

Natural gas is another clean-burning alternative fuel source, and is comprised of various hydrocarbons, primarily methane. Similar to propane, natural gas is abundant in the United States, between 80% and 90% of the natural gas used in the U.S. was domestically produced. The U.S. utilizes natural gas for a quarter of its energy with one-third each going to the residential district, industry, and electric power production. However, it can also be used as compressed natural gas (CNG) or liquefied natural gas (LNG) to fuel vehicles.

Natural gas must be stored in a compressed gaseous or liquefied state because of its gaseous nature. The two forms of natural gas are both clean burning, domestically produced, and relatively low priced. Nonetheless, natural gas vehicles (NGVs) have some disadvantages to consider, such as shorter driving

---

[13] Gary Gereffi et al., *Manufacturing Climate Solutions: Carbon-Reducing Technologies and U.S. Jobs*, Center on Globalization Governance & Competitiveness, Duke University (2009).

[14] Alternative Fuels Data Center, "Propane Fuel Basics," U.S Department of Energy, http://www.afdc.energy.gov/fuels/propane_basics.html

ranges and the lack of NGVs being produced. In 2010, there were fewer than 40,000 total natural gas HDVs on the road. Sales of new HDVs fueled by natural gas peaked at about 8,000 in 2003, and less than 1,000 were sold in 2010. Further, the costs of a new CNG and LNG vehicle are significantly more expensive than a new diesel vehicle, $49,000 and $86,000, respectively.

Table 2: Cost Alternative Fueled Vehicles

Alternative Fueled Vehicles	Additional Cost Compared with a New Diesel
Liquefied Petroleum Gas	$20,000
Compressed Natural Gas	$49,000
Liquefied Natural Gas	$86,000

Another area of serious concern for both alternative fuels is the limited fueling infrastructure and the cost of purchasing and installing the required equipment for the fueling stations, which can range between $37,000 and $175,000 for LPG depending on the situation. Whereas costs for installing a CNG fueling station can range from $10,000 to $2 million, and a LNG fueling site can range from $1 to $4 million. Although alternative fuels have some good advantages, it may be years until they are fully realized.

SuperTruck Program

The SuperTruck Program was initiated by the U.S. Department of Energy in 2009 to improve the freight efficiency of heavy-duty trucks, as Roland Gravel, who oversees SuperTruck at the DOE, said, "SuperTruck is about developing high-risk technologies and breaking new ground as we can move towards energy independence.[15]" However, Daimler Trucks North America has affirmed that many high-risk SuperTruck-type technologies are not ready for prime time, especially given a limited timeframe to develop and evaluate these technologies for Phase 2. Further, DTNA stated that any increase in stringency for Phase 2 should reflect the limited time to develop the program and not force unproven technologies.

Currently, manufacturers are still working to absorb tremendous changes in regulations to the trucking industry, and the industry needs time to focus on optimizing these onerous regulatory requirements and reduce cost and improve reliability for consumers. The increased costs to new trucks are a significant burden for small business owner-operators.

[15] Timothy Cama, "Five Manufactures on Track to Meet SuperTruck Goals," *Transport Topics* (2012), http://www.ttnews.com/articles/basetemplate.aspx?storyid=28640

Others

The following is a list of other technologies considered:

- Waste Heat Recovery Technology
- Automatic Engine Shutdown
- Accessory Improvements (water pumps, fans, auxiliary power units, air conditioning, etc.)

All of the technologies listed above have their advantages to increase fuel efficiency and reduce GHG emissions. Unfortunately, however, many of these technologies come at a hefty price that a majority of small business owner-operators cannot afford. Further, some of the technologies are still being developed at the expensive of millions of dollars, while their benefits are inconclusive and unproven. Nevertheless, there are other alternatives that the EPA and NHTSA might consider which very well could have a greater immediate impact at lower costs such as proper driver training.

In May 2011, SmartDrive, a innovative solutions company, conducted a study of 695 Class 8 truck drivers to determine the effect of fuel efficiency training. The study results showed that 80% of fuel waste involves acceleration, deceleration, speeding and turning. Furthermore, the study found that by following eco-driving best practices, drivers could improve fuel economy on average up to 22%. That average reduction in fuel consumption could save fleet operators as much as $12,553 per vehicle in fuel cost annually.[16]

In fact, by simply changing the driving habits to improve smooth driving performance, lower speeds and reduce unnecessary idling, fleets affirmed that eco-driving can realize significant improvement in fuel mileage and reduce operating expenses, and reduce hydrocarbon, carbon monoxide, carbon dioxide, and nitrogen oxide emissions. Within two months of driver training, the fuel economy increased to an average of 6.73 mpg from a baseline of 5.92 mpg, which is a 14 percent increase. The top 25 percent performing drivers improved their fuel economy to 7.98 mpg after two months of training.[17]

[16] *Fuel Efficiency Study: Commercial Transportation*, SmartDrive (May 2011).
[17] Ibid.

Bibliography

Alternative Fuels Data Center. (2013, November 26). *Propane Fuel Basics.* Retrieved March 2014, from United States Department of Energy: http://www.afdc.energy.gov/fuels/propane_basics.html

Brown, S. F. (2013, February 15). *More Traction for Fuel-Efficient Tires.* Retrieved March 2014, from The New York Times: http://www.nytimes.com/2013/02/17/automobiles/more-traction-for-fuel-efficient-tires.html?_r=2&

Cama, T. (2012, February 6). *Five Manufacturers on Track to Meet SuperTruck Goals.* Retrieved March 2014, from Transport Topics: http://www.ttnews.com/articles/basetemplate.aspx?storyid=28640

CARB. (2008). *Initial Statement of Reasons: Proposed Regulation to Reduce Greenhouse Gas Emissions from Heavy-Duty Vehicles.* Sacramento: California Air Resources Board.

CARB. (2011). *Final Regulation Order: Tractor-Trailer Greenhouse Gas Regulation.* Sacramento: California Air Resources Board.

CCJ Staff. (2011, September 1). *J.D.: Heavy-duty engine quality, satisfaction up since last year.* Retrieved March 2014, from Commercial Carrier Journal: http://www.ccjdigital.com/j-d-power-heavy-duty-engine-quality-satisfaction-up-since-last-year/

Gereffi, G., Dubay, K., & Lowe, M. (2008). *Manufacturing Climate Solutions: Carbon-Reducing Technologies and U.S. Jobs.* Center on Globalization, Governance & Competitiveness, Duke University.

Jones, J. (2012, December 12). *Truck occupant fatalities up 20 percent.* Retrieved March 2014, from Land Line Magazine: http://www.landlinemag.com/Story.aspx?StoryId=24533#.VJGYuofQepo

Loveday, E. (2012). *Range-Increasing Low-Rolling Resistance Tires Falling Out of Favor with Drivers.* Retrieved March 2014, from Inside EVs: http://insideevs.com/range-increasing-low-rolling-resistance-tires-falling-out-of-favor-with-drivers/

National Research Council. (2010). *Technologies and Approaches to Reducing the Fuel Consumption of Medium- and Heavy-Duty Vehicles.* Washington, DC: The National Academies Press.

Smart Drive. (2011). *Fuel Efficiency Study: Commercial Transportation.* Smart Drive.

Vanhoenacker, M. (2013, April 3). *What's That Thing? Truck Fins Edition.* Retrieved March 2014, from Slate Magazine: http://www.slate.com/blogs/browbeat/2013/04/03/truck_panels_what_do_they_do_explained_photos.html