Before the:

U.S. Environmental Protection Agency
(Docket No. EPA-HQ-OAR-2014-0827)
and U.S. Department of Transportation,
National Highway Traffic Safety Administration
(Docket No. NHTSA-2014-0132)

Comments of the:
AMERICAN TRUCKING ASSOCIATIONS

On the:

Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles; Phase 2;
Proposed Rule
(Federal Register, July 13, 2015, Pg. 40137)

October 1, 2015
INTRODUCTION

The American Trucking Associations (“ATA”) appreciates the opportunity to comment on the U.S. Environmental Protection Agency and National Highway Traffic Safety Administration Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles; Phase 2; Proposed Rule published in the Federal Register on July 13, 2010, Pg. 40137 (“Phase 2 Rule” or “Phase 2”). ATA also appreciates efforts to help improve truck fuel efficiency and reduce the industry’s carbon footprint.

ATA is the national trade association that represents the U.S. trucking industry.ATA is keenly interested in the proper and logical development of this rule given its potential impact on fleets, goods movements, consumer goods pricing, and the nation’s economy.

The trucking industry is composed of both large national enterprises as well as a host of small businesses, all of whom operate in extremely competitive business environments, with narrow profit margins. According to the U.S. Department of Transportation (“DOT”), 97% of motor carriers have 20 or fewer trucks and 91% operate six trucks or less. For small carriers in particular, their livelihood can be dramatically impacted by new regulatory requirements.

With more than 600,000 interstate motor carriers in the U.S., the trucking industry is the driving force behind the nation’s economy. Trucks haul nearly every consumer good at some point in the supply chain. Few Americans realize that trucks deliver nearly 69% of all freight tonnage or that 80% of the nation’s communities receive their goods exclusively by truck. Even fewer are aware of the significant employment, personal income, and tax revenue generated by the motor carrier industry. Over seven million people employed in the trucking industry move approximately 10 billion tons of freight annually across the nation. Trucking annually generates $700 billion in revenues and represents roughly five percent of our nation’s Gross Domestic Product. One out of every 15 people working in the private sector in the U.S. is employed in a trucking-related job including the manufacturing, retail, public utility, construction, service, transportation, mining, and agricultural sectors. Of those employed in private-sector trucking-related jobs, 3.4 million are truck drivers.

ATA supports efforts to reduce greenhouse gas (“GHG”) emissions and fuel consumption to make our country more energy independent and ensure our industry is as sustainable and fuel-efficient as possible. Fuel efficiency of line-haul trucks had historically not improved appreciably over the last quarter century averaging between 6.0 and 6.5 miles per gallon. In recognition of this fact, and in order to help reduce the trucking industry’s carbon footprint, U.S. Environmental Protection Agency (“EPA”) and the National Highway Safety Administration (“NHTSA”) finalized the U.S. Environmental Protection Agency and National Highway Traffic Safety Administration Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles (Federal Register September 15, 2011, Pg. 57106) (“Phase 1 Rule” or “Phase 1”). This rule

---

1 ATA is a united federation of motor carriers, state trucking associations, and national trucking conferences created to promote and protect the interests of the trucking industry. Directly and through its affiliated organizations, ATA represents more than 34,000 companies encompassing every type and class of motor carrier in the United States and Canada.
was endorsed by ATA given that the regulation largely codified technologies that the trucking industry had tested and recognized as being effective in improving fuel efficiency over an extended period of time.

Even before EPA and NHTSA began the Phase 1 rulemaking process, ATA was proactive in addressing its fuel consumption and carbon footprint. In May 2008, ATA unveiled its industry sustainability plan entitled *Strategies for Reducing the Trucking Industry’s Carbon Footprint* ([http://www.trucksdeliver.org/pdfs/Campaign_Executive_Summary.pdf](http://www.trucksdeliver.org/pdfs/Campaign_Executive_Summary.pdf)). Included in the plan’s six key recommendations, ATA endorsed national fuel economy standards for medium- and heavy-duty trucks so long as they are “both technologically and economically feasible.”

In its capacity as the national representative of the trucking industry, ATA regularly comments on matters affecting the trucking industry’s common interests, providing its expertise and understanding of the industry to help avoid unintended consequences from proposed regulatory requirements. While Phase 2 is not specifically directed at trucking fleets, the trucking industry’s future purchasing decisions will ultimately decide the success or failure of this rule. The consistent message from fleets to ATA regarding the Phase 2 Rule is abundantly clear – achieve the greatest efficiency improvements at the least overall cost while minimizing downtime, maximizing durability, and recognizing a positive return on investment over the course of equipment ownership. While ATA supports the underlying goals of the Phase 2 Rule, our comments outline our members’ concerns including:

1. **ATA Opposes Alternative 4**
2. **Market Penetration Rates for Certain Tractor Technologies are Overly Aggressive**
   a. Waste Heat Recovery (15% in 2027)
   b. 6x2 Axle Configurations (60% in 2024)
   c. Auxiliary Power Units and Automatic Engine Shutdown Devices (90% in 2024)
   d. Automatic Tire Inflation Systems (40% in 2024)
   e. Low Rolling-Resistance Tires
3. **Certain Market Penetration Rates for Medium Heavy-Duty Vocational Vehicles are Questionable**
   a. Electrification and Hybridization (18% in 2027)
   b. Lower Low Rolling-Resistance Tires (50% 6.9 Crr Steer Tires in 2027; 15% 6.5 Crr Drive Tires in 2027)
4. **Technology Costs Remain Suspect**
   a. Waste Heat Recovery
   b. 6x2 Axle Configurations
   c. Auxiliary Power Units
   d. Low Rolling-Resistance Tires
   e. Aerodynamic Devices
   f. Automatic Tire Inflation Systems
5. Increased Warranty, Maintenance, and Downtime Costs Should be Included
6. Errors in EPA’s Baseline and Testing Protocols Result in Overly-Stringent Standards
7. Clean Air Act Section 203 Tampering Provisions Will Cause Hesitation for Fleets
8. Tire Pressure Monitoring Systems Should be Given Credit Under the Rule
9. New Standards for Auxiliary Power Units Will Increase Cost and Discourage Use
10. Research Must Confirm Safety of New-Generation HHD LRRTs Before Market Entry
11. Useful Life of LRRTs Must be Considered
12. NHTSA Should Continue to Review and Analyze Potential Safety Impacts of Fuel Efficiency Technologies
13. Need for Harmonization Between State and Federal GHG/Fuel Economy Programs
14. Drive Cycle Weightings Need to be Re-Evaluated
15. Credit for Use of Vehicle Speed Limiters Needs to be Expanded
16. Further Evaluation and Demonstration is Needed Before Committing to a Low-NOx Engine Standard
17. Manufacturers Should not Limit Vehicle Purchasing Options
18. NHTSA Should be Aware of Potential Impacts of Regulating Under-Ride and Over-Ride Guards
19. Natural Gas Vehicle Development and Deployment Must not be Stymied
   a. In-Use Natural Gas Fuel Standards Should be Addressed Outside of Rule
   b. Natural Gas Carbon Footprint Should Exclude Upstream Emissions
   c. Industry is Better Situated to Determine LNG Tank Hold-Times
20. Use of Advanced Technology Credits Should Continue
21. Trailer Concerns
   a. Consideration Should be Given to Exempt Certain Trailers from Using ATISs
   b. Light-Weighting Must Account for Additional Weight and Impacts on Durability
   c. Drop-Floor Trailers Should be Afforded Efficiency Credit
   d. Establishing a Trailer ABT Program Will Provide Fleets More Flexibility
   e. Fleets Should not be Forced to Invest in Inefficient Trailer Technologies
   f. In-Use Trailers Should be Used in Establishing Compliance Baseline
   g. Additional Trailer Exclusions are Needed
22. A Contingent Mid-Course Review Should be Incorporated Into the Final Rule
COMMENTS

1. **ATA Opposes Alternative 4**

Phase 2 will only be successful if projected future technology patterns are wholly recognized. Making the best predictions on what the trucking sector will look like in over a decade from now is an extremely difficult undertaking. Factors such as the state of technology development, fleet buying patterns, future industry-wide purchasing estimates, the strength of the national and global economies, along with fuel and equipment pricing, will determine whether the agencies’ proposed targets can be achieved. Given this multitude of variables, ATA strongly urges the agencies to adopt Alternative 3 as the chosen pathway subject to addressing various concerns contained in our comments. Current cost projections and efficiency improvements do not, and should not, warrant pulling-ahead the 2027 targets to 2024 as proposed under Alternative 4. Such approach would result in serious market disruptions and force unproven technologies into the market before being fully tested and verified – a dire result the industry seeks to avoid given the recent history fleets experienced involving the regulation of particulate matter (‘PM”) and nitrogen oxides (‘NOx”) emissions.

2. **Market Penetration Rates for Certain Tractor Technologies are Overly Aggressive**

The agencies’ estimated market penetration rates (“MPRs”) form the cornerstone of the rule. If these MPRs are set too high, original equipment manufacturers (“OEMs”) will be facing an uphill battle from the start in meeting their targets. The MPRs appear to be optimistically aggressive, resulting in overly stringent emission standards. The stringency of the standards should be set based on the needs of the market, realistic goals, and on products customer can afford to purchase. Targets under the rule should not rely on the optimism of technology providers who stand to financially benefit from the setting of high, and possibly unrealistic, standards. Customers should not be forced to buy technologies in order for an OEM to meet a regulatory target. If Phase 2 results in customers being led down a path to purchase technologies that are not proven, cost-effective, or reasonable for a fleet’s applications, fleets will keep their vehicles and trailers longer and will pre-buy in advance of the changes, followed by a subsequent no-buy after the new standards take effect. We have witnessed these buying patterns frequently, the most recent being in 2002 and 2006. A repeat of this pattern will delay both environmental and fuel consumption aims and impede the success of the rule.

ATA formed a Fuel Efficiency Advisory Committee (“FEAC”) comprised of fleet and trailer representatives to offer perspectives and provide guidance to ATA on the rule. Over the last two years the FEAC has met with EPA, NHTSA, OEMs, and suppliers on a regular basis to share data, information, industry survey results, and provide overall input. The FEAC developed 15 Guiding Principles on the Phase 2 Rule which have served as the framework for ATA’s positions. Two specific principles relating to the introduction of new technologies are of critical importance to the trucking industry, namely: (1) the advancement of GHG and fuel consumption reductions must be based upon sound science and must be economically achievable, and (2) such standards must not be technology-forcing.

---

2 See Appendix 1, ATA Fuel Efficiency Guiding Principles (July 22, 2014).
Specific technology MPRs under the Phase 2 Rule appear to be overly aggressive and must be adjusted downward for fleets to afford flexibility in spec’ing equipment, avoid excessive downtime due to unforeseen maintenance requirements, and maintain equipment affordability. The specific market penetration rates of concern are as follows:

**a. Waste Heat Recovery (15% in 2027)**

Waste heat recovery (“WHR”) was explored as a potential fuel efficiency technology under the U.S. Department of Energy’s SuperTruck initiative – a program developed to advance the fuel efficiency of tractor-trailers by 50% over baseline models. The SuperTrucks equipped with WHR were developed and unveiled by heavy-duty manufacturers in project demonstration vehicles funded through federal and private sector sources. However, these prototype trucks are currently not production-ready and therefore have not been thoroughly tested across the challenging and widely varied duty-cycles that exist within our industry. ATA member fleets have clearly expressed their desire to only purchase technologies that are thoroughly tested, verified, affordable, and proven to be both durable and affordable.

**b. 6x2 Axle Configurations (60% in 2024)**

Single axle 6x2 drive tractors are widely used in European trucking operations and have been for some time. For U.S. regional fleets that make a lot of deliveries, it is often not the best technology choice because of curb cuts and other uneven terrain features that can expose the truck to traction issues.

ATA member fleets have not universally endorsed such technology. Recent surveys indicate current market penetration rates of new line-haul 6x2 tractor sales are only in the range of 2%. According to ATA member fleets, reasons for the current low level of adoption include limitations to highway applications, less flexibility, lower residual rates when switching to vocational applications, traction issues, driver dissatisfaction, tire wear and spec’ing, legality of their use, and driver acceptance. While recent improvements in traction control systems can automatically shift weight for short periods of time from the non-driving axle to the driving axle during low-traction events, concerns remain over the impacts to highways caused by such shifting of weight between axles.

“Non-liftable” 6x2 axles in the states of North Dakota, Kansas, Indiana, Pennsylvania, Connecticut, Massachusetts, and New Hampshire are currently prohibited. “Liftable” 6x2 axles are legal across the country with the possible exception of Utah. Utah had required that lift axles be steerable. However, it is our understanding that state officials have agreed to revise their language to ensure their legality. Many carriers also conduct cross-border operations with Canada. 6x2 axle configurations are illegal in the province of British Columbia and face regulatory restrictions in other provinces as well. Fleet owners must remain vigilant to deploying 6x2 technologies only to jurisdictions that permit their use.

---

6x2 axle configurations can restrict future resale markets by limiting the types of applications where these types of configurations can be used. Residual values of equipment are critical for fleets in making their purchasing decisions. Since resale values are not calculated into the overall estimated costs under Phase 2, constricting after-market resale opportunities for initial purchasers of equipment will extend the payback periods on 6x2s, making them less cost-effective in many applications. EPA and NHTSA should not assume an overly optimistic 60% market penetration rate for 6x2s in the 2024-2027 timeframe nor, in our opinion, will a 20% adoption rate in 2021 likely be recognized. EPA and NHTSA need to gather further information and modify the anticipated purchase rates accordingly. In addition, both agencies should jointly engage in additional study of any safety and regulatory challenges associated with 6x2 technology applications.

c. Auxiliary Power Units and Automatic Engine Shutdown Devices (90% in 2024)

Fleets are aware that reduced engine idling results in fuel-savings, reduced engine-wear, and environmental improvements. Fleets have a variety of choices available in providing driver power and comfort in-lieu of idling including use of auxiliary power units (“APUs”), fuel-fired heaters, shore power, battery stand-by, stand-alone anti-idling infrastructure establishments, and hotel accommodations, to name a few. Not all operations require the use of APUs yet the agencies assume that 90% of tractors with sleeper cabs will purchase APUs if an automatic engine shutdown device (“AESs”) is installed.

Fleets that already limit idling either via slip-seat operations (where drivers take turns driving on a rotational basis) or use fuel-fired heaters will not get adequate payback from installation of an APU. Fleets may also see reduced load capacity due to the additional weight of an APU and possibly worse aerodynamics from a larger trailer gap if the space for an APU requires a longer wheelbase.

Most fleets already purchase “programmable” idle shutdown timers to limit idling due to the national patchwork of anti-idling laws currently in place. These timers are typically set for a given period of time throughout the initial fleet’s ownership period. As witnessed under Phase I, fleets are unwilling to purchase hard-programmed, tamper-proof AESs given their need for flexibility regarding their resale of used equipment on the secondary market.

If forced into using AESs and APUs as the agencies propose, fleets will likely pre-purchase vehicles in advance of such requirement. Mandatory AES use should not be considered part of the stringency requirements under Phase 2. ATA supports efficiency credits for idling reduction options installed by fleets (i.e., APUs, direct-fired heaters, etc.) either at the OEM point-of-sale or installed in the after-market. For idling devices installed in the after-market, the agencies should allow OEMs appropriate credit upon receipt of certified proof from fleets of such installations. The agencies’ over-riding assumption should be that a fleet expending capital on an anti-idling device has every intention to utilize such equipment. Such fuel savings and carbon reductions must be recognized and accounted for.
d. Automatic Tire Inflation Systems (40% in 2024)

Phase 2 provides credit only for the use of automatic tire inflation systems (“ATISs”). Tire pressure monitoring systems (“TPMSs”) provide similar benefits but at a lower cost. To the extent efficiency credit is provided for tire pressure maintenance devices, TPMSs should be afforded the same amount of efficiency credit as ATISs.

A recent study on truck and tire inflation systems indicates that both ATISs and TPMSs are being utilized in fleet operations. As of 2012, approximately 33% and 10% of surveyed fleets utilize ATISs and TPMSs respectively on their trailers. Roughly 1% of tractors used ATISs. Operators are well aware of the increased fuel consumption, maintenance costs, downtime, and safety concerns associated with operating heavy-duty vehicles with under-inflated tires. These concerns over time have been significant given the historic volatility of diesel prices, the competitive nature of the industry, shipper pressures to reduce costs, and the rising costs of liability.

The agencies do not acknowledge TPMSs as a viable menu option since they require user interaction to inflate tires to appropriate pressures. A misguided assumption is that drivers “may” continue to operate a vehicle with under-inflated tires. However, in light of continual pressures on fleets to reduce total costs of operation in order to remain competitive and profitable, the agencies should reconsider their rejection of TPMSs as a viable technology option under the rule.

Given the ability of fleets to monitor fuel consumption remotely, including the ability to identify causes for increased fuel consumption, drivers are routinely held responsible for proper tire pressure levels on TPMS-equipped vehicles. ATA therefore believes that the agencies should provide efficiency credit for TPMS use under the rule.

e. Low Rolling-Resistance Tires

The tire market penetration rates projected in the outlying years are indeed technology-forcing. If tire composite advancements and designs do not keep pace with the target years, OEMs will not be able to hit their overall efficiency targets. In addition, since anti-tampering rules require retention of all original features, fleets may likely choose tires with higher rolling resistance (less efficiency) to maintain more flexibility in replacing tires in the field when needed.

The agencies err in their tire analysis by using the same rolling resistance for all types of day and sleeper cabs. The need for and benefit of low rolling resistance tires (“LRRTs”) on a high roof sleeper cab is very different from the other tractor categories. The agencies should continue to examine fleet tire data and adjust tire stringency levels to account for fleet and Class variations and different duty-cycle needs.

---

Comments of American Trucking Associations
Dockets EPA-HQ-OAR-2014-0827 and NHTSA-2014-0132
October 1, 2015

3. Certain Market Penetration Rates for Medium Heavy-Duty Vocational Vehicles are Questionable

   a. Electrification and Hybridization (18% in 2027)

To date, the only heavy-duty vocational applications that have demonstrated commercial viability are urban bus applications where public dollars are available. Despite several manufacturers developing hybrid technology that is production-ready, potential customers who had positive experience with demonstration projects could not make the business case for additional purchases due to exorbitant costs. Hybridization remains the most expensive technology option under Phase 2 ranging from $23,904 to $18,534 in 2021 and 2027 respectively. Heavy-duty hybrid penetration is essentially non-existent outside the municipal arena. If the agencies still wish to include vocational vehicle hybridization market penetration rates, ATA recommends treating these technologies as advanced technologies and not assess specific MPRs under the rule. ATA further expands upon the need for the agencies to retain advanced technology credits under the Phase 2 Rule below.

   b. Lower Low Rolling-Resistance Tires (50% 6.9 Crr Steer Tires in 2027; 15% 6.5 Crr Drive Tires in 2027)

Tire rolling resistance must be tailored to each vehicle subcategory. This especially holds true with respect to Class 4-6 vocational vehicles. SmartWay tire verification focuses on in-use highway applications – not vocational operations. Class 6 tires currently have a heavy-rub band on the sidewall to prevent sidewall damage largely caused by excessive scrubbing against curbs during urbanized hauls. Thicker sidewalls help maintain casing integrity and affords fleets the ability to get close to four subsequent retreads. LRRTs typically do away with thicker side bands to lower tire weight (in the range of 30%) and get better fuel economy test track results. Unfortunately, fleets do not deliver goods on test tracks and even the best drivers have contact with curbs throughout their delivery schedules.

The four tire levels set out under the rule will have shorter useful lives and will minimize recap opportunities. It takes 23 gallons of oil to manufacture a new tire and only 8 gallons to retread – a statistic that cannot be ignored in undertaking both carbon and fuel use analyses under the proposal. If better tire rolling resistance levels can be achieved while maintaining heavy-rub bands needed for greater casing integrity and durability, ATA would be in a better position to support the vocational tire requirements set out under the rule.

Finally, many vocational applications need to go off-road at construction sites, mining operations, landfills, and similar locales. The transition to LRRTs would not satisfy customer needs for adequate traction in these environments. ATA requests that the agencies conduct independent and robust studies of new generation LRRTs in advance of their entry into the marketplace to assess safety, traction, and availability.
4. Technology Costs Remain Suspect

ATA believes the agencies underestimated the costs of various technologies making the payback period on these technologies much longer than is stated in the proposed rule. A fleet owner typically demands an 18-month payback on technology purchases. If the actual payback extends beyond 24 months, it will likely lead to the risk of increased fleet pre-buy, low-buy, and no-buy scenarios. The Phase 2 Rule currently envisions a maximum 24-month payback period. If variables such as predicted technology costs, MPRs, and fuel costs are not accurate, fleet payback periods for equipment may not be recognized during the period of equipment ownership. Moreover, likely additional costs for maintenance and downtime for new technologies need to be wholly accounted for under the rule. If payback on equipment purchases is pushed beyond ownership periods, there is little or no incentive for fleets to make the initial investments in technologies under Phase 2.

To further expand upon this point, let’s focus on one payback period variable. The table below is an abbreviated version of the fuel pricing forecasts contained in the June 2015 Phase 2 Draft Regulatory Impact Analysis (with an additional line added for present-day fuel pricing comparisons).

<table>
<thead>
<tr>
<th>Year</th>
<th>Gasoline Post-Tax and % Increase Over Baseline</th>
<th>Diesel Post-Tax and % Increase Over Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 28, 2015&lt;sup&gt;5&lt;/sup&gt;</td>
<td>$2.32 (+30%)</td>
<td>$2.48 (+42%)</td>
</tr>
<tr>
<td>2018</td>
<td>$3.02 (+30%)</td>
<td>$3.53 (+42%)</td>
</tr>
<tr>
<td>2021</td>
<td>$3.12 (+34%)</td>
<td>$3.74 (+51%)</td>
</tr>
<tr>
<td>2024</td>
<td>$3.26 (+41%)</td>
<td>$3.92 (+58%)</td>
</tr>
<tr>
<td>2027</td>
<td>$3.36 (+45%)</td>
<td>$4.08 (+65%)</td>
</tr>
</tbody>
</table>

If diesel fuel costs are indeed more than 50% higher than present day fuel pump prices, it is logical to assume that estimated payback periods are reduced (assuming the agencies have accurately forecasted future technology pricing). Moreover, likely additional costs for maintenance and downtime for new technologies need to be wholly accounted for under the rule. If these assumptions are incorrect or lacking and payback on equipment purchases is pushed beyond typical ownership periods (oftentimes 36-48 months), there is little or no incentive for fleets to make investments in technologies under Phase 2.

Another example is the 2004-2010 rulemakings to reduce particulate matter and nitrogen oxide emissions from on-road heavy-duty engines. EPA estimated the proposed standards would add a cumulative cost of more than $5,000 to a new vehicle. In reality, the trucking industry saw record-setting cost increases of more than $20,000 per new vehicle, a four-fold increase.<sup>6</sup> Ancillary costs incurred by fleets as a result of these rulemakings include missed and late loads and, in some cases, lost hauling contracts. Fleet owners also run the risk of losing drivers if they are forced to operate

---


<sup>6</sup> Calpin, Patrick & Esteban Plaza-Jennings, A Look Back at EPA’s Cost and Other Impact Projections for MY 2004-2010 Heavy-Duty Truck Emissions Standards, American Truck Dealers (February 2012).
trucks having new, unproven technologies while other fleets continue to operate vehicles with proven technologies. The trucking industry can ill-afford to lose any drivers as we currently face a severe shortage of 35,000 drivers. In fact, this figure could balloon to nearly 200,000 drivers by 2025 given current employment trends. While it remains uncertain as to how costs over a decade away were derived, it is a fact that several of these costs will be off by several orders of magnitude.

ATA’s comments on specific technology costs are as follows:

a. Waste Heat Recovery

The agencies assume Waste Heat Recovery (‘WHR”) technology will cost $10,523 in 2021. Figures derived from the DOE SuperTruck program ranged from $7,200 - $15,000. Because WHR is not currently in the market, the actual costs remain unknown. Some OEMs state that the agencies’ costs are actually higher than this figure while another OEM says it is over-inflated. This wide-ranging pricing uncertainty should raise a cautionary flag to the agencies. WHR is the highest cost menu item under the current heavy heavy-duty engine technology listings. The agencies must be more transparent in how they derived such cost figures given they are being so widely contested by all the OEMs. As you can imagine, these cost uncertainties have only escalated fleet concerns over the future pricing of equipment under Phase 2.

b. 6x2 Axle Configurations

The agencies should include in its cost calculations the additional tire wear and negative residual values associated with 6x2’s.

c. Auxiliary Power Units

EPA estimates the cost of APU’s in 2021 and 2027 as $4,899 and $4,327 respectively. APU costs are substantially higher than this figure; being somewhere in the range of two to three times this estimate. EPA needs to use actual APU costs in its calculations. Of further note, the California Air Resources Board (“CARB”) requires particulate filters on diesel APUs. According to suppliers, filtering an APU increases the cost of such a device by up to 20%. Electric APUs are an alternative but such devices will put a strain on deep-cell batteries and will likely require back-up battery power sources, adding additional weight and cost to the tractor.

The assumption under the rule is that installation of an AES will result in the companion installation of an APU. There are, however, numerous anti-idling alternatives to diesel-powered APUs specific to fleet needs including direct-fueled heaters, electric APUs, shore power, battery power, and certain stationary providers of power and driver comforts. Each of

7 American Trucking Associations, Economics Department.
8 Id.
these technologies should be afforded recognition under the rule and recognized in terms of their costs, efficiency attributes, and MPRs

d. Low Rolling-Resistance Tires

Instead of using current cost data, EPA appears to have based the cost calculations for LRRTs on 1999 data indexed for inflation. Moreover, EPA’s cost figures for LRRTs do not account for increases in lifetime replacement costs due to reduced tire life resulting in fewer retreads.

e. Aerodynamic Devices

Estimated costs of future aerodynamic devices appear low given the historical nature of the proposed changes. The agencies should describe in detail the component packages they expect to satisfy each bin level, cost breakdowns of these individual components, and how this technology will be modified over time to maintain compliance with increasingly stringency levels.

f. Automatic Tire Inflation Systems

The cost estimates for tire inflation systems (and TPMS, where applicable) must include warranty limitations, useful life, maintenance and replacement costs, as well as costs of false warnings.

5. Increased Warranty, Maintenance, and Downtime Costs Should be Included

The proposed Phase 2 standards represent a more technology-forcing approach than Phase 1, predicated on use of both off-the-shelf technologies and emerging technologies that are not yet in widespread use. Past experience with emerging technologies in heavy-duty engines has shown that warranty claims, where an operator takes a vehicle out of service to a maintenance facility to have a part under warranty replaced, tend to be higher during the initial years of introduction.

As shown in Appendix 3, based on warranty claims data required to be submitted to CARB, particulate filter-related warrantee claims were at 35% during their initial year of introduction (2007), decreased to 18% during the second year and fell to 4% during the fifth year (2011, the last year of data provided). Similarly, SCR-related warranty claims were at 20% during their initial year of introduction (2010) and decreased to 10% during the second year (2011). Also of note is how other technologies were affected during the introduction of a new technology. For example, warranty claims for engine/ECM/other components increased from 22% prior to the introduction of particulate filters to 90% during the first year this technology was introduced.

This data highlights the fact that additional warranty, maintenance and downtime costs result when new or significantly altered technologies are introduced. It appears the proposed rule only includes increased maintenance costs associated with tires. Based on operational cost data collected from

---

9 Federal Register, p. 40154.
motor carriers, the cost of repair and maintenance accounts for 6-9% of the marginal cost of operating a truck. This is 3 to 4 times more than tire costs. ATA requests the agencies to further examine the warrantee claims and operational cost data to develop an algorithm that accounts for additional warranty, maintenance and downtime costs as part of the final rule.

6. Errors in EPA’s Baseline and Testing Protocols Result in Overly-Stringent Standards

The proposed emission standards are actually much more stringent than EPA has indicated. An overly stringent regulation can have several unintended consequences. It could force OEMs to specify a truck optimized for EPA duty-cycles rather than a customer’s requirements, which could actually increase fuel consumption and GHG emissions, or render the truck inadequate for its intended use. If OEMs cannot provide the trucks a customer needs, the customer has no choice but to continue using their existing trucks. The actual stringency in the proposed rule is much greater than what EPA has indicated due to errors in EPA’s baselines and testing protocols, such as:

- The assumed 2017 aero baseline uses the best aero trucks available, not the average.

- The baseline assumes 30%, and up to 90%, of high-roof sleeper cabs will be equipped with non-programmable 5-minute automatic engine shutdown devices when, in fact, very few fleets selected this option under Phase 1. This 5% efficiency allocation is not likely to come to fruition when fleets are unwilling to spec’ out equipment with this option.

- Cab aerodynamic expectations (Bins V, VI, and VII) likely cannot be achieved with the specified test trailer.

- Compliance margins for aerodynamic audits have been removed. OEMs therefore must over-design (if plausible) to offset this margin omission and pass routine audits.

- Compliance margins are not provided for engine fuel map audits requiring OEMs to over-design (if plausible) beyond their certification levels to ensure passing routine audits.

In summary, these issues create impossible hurdles that could not be met within the framework of the rule and the agencies must work with OEMs to rectify these matters.

7. Clean Air Act Section 203 Tampering Provisions will Cause Hesitation for Fleets

Fuel-efficient, add-on equipment on a tractor or trailer is now considered to be emission control devices subject to the provisions under Clean Air Act Section 203. In the past it was abundantly clear that modifications made to an EPA-certified “engine” that increased emission levels was considered tampering and subject to an enforcement action. It would be a stretch to envision that Congress’ original intent was to characterize mismatched tires with different levels of rolling resistance, pieces of plastic, or non-functioning tire inflation systems as being subject to enforcement actions under Section

---

203’s tampering provisions.

Fleets continue to express concerns over the potential for future enforcement actions involving such mundane matters by either the agencies or states. If such actions do indeed occur, fleets will seriously decide whether to specify fuel-efficient equipment when they place their orders with OEMs. In the alternative, fleets will invest in fuel-efficient equipment in the aftermarkets which will not benefit OEMs in meeting their targets or the agencies’ objectives.

Section 207 of the Clean Air Act states that compliance by vehicles and engines “in use” is done through manufacturer warranties that are provided to purchasers. Several of the equipment maintenance concerns under Phase 2 will therefore be addressed under appropriate warranty claims. Once such warranties expire, it follows that enforcement burdens will likely shift onto fleets. An overriding presumption must be recognized that fleets purchasing expensive, fuel-efficient technologies have both the interest and intent to use and maintain such equipment. To do otherwise would be economically counter-productive and ill-conceived. Therefore, ATA strongly recommends that any enforcement actions that may be directed at fleets (beyond engine alterations) be addressed with “fix-it” tickets versus financial penalties.

8. Tire Pressure Monitoring Systems Should be Given Credit Under the Rule

TPMS have not historically been included in the EPA’s SmartWay program since the agency had no way to determine the effect these systems have on fuel economy unless each requesting fleet provided a clear description of how it would respond to alerts. This information was necessary so that the EPA could calculate the resulting fuel savings. However, much has transpired since the inception of the SmartWay Program. The Federal Motor Carrier Safety Administration (“FMCSA”) has studied TPMS since 2006. It found that these systems accurately reported inflation pressure values within 2 to 3 psi of the measured value and accurately warned of low pressure within 2 to 3 psi of the expected threshold. In 2007, the performance and durability of TPMS was examined in a field test using transit buses. This study found that TPMS-equipped buses did not experience increased average tire pressure due to diligent tire pressure maintenance and the location of the TPMS display is essential to impact tire maintenance practices, fuel economy, and tire life.

In late 2011, the FMCSA published the results of a field test it conducted over the previous 24 months of tire pressure monitoring and ATIS on two fleets that were considered to have good tire maintenance. The test revealed that both TPMS and ATIS delivered a 1.4% improvement in fuel economy.

Technology has greatly advanced since the tests that FMCSA conducted. Today, TPMS is much more advanced than the first generation of TPMS that was tested by FMCSA which just delivers alerts to the driver in the cab through an in-cab display. Second generation TPMS (TPMS 2.0 systems) are integrated with telematics and GPS so that the tire data and alerts are sent from vehicles and delivered to a fleet’s operations and maintenance department. By providing the fleet with the location and visibility of its tire problems, dispatch can provide instructions to the driver to handle developing tire problems immediately and maintenance is aware of the exact nature of these issues when the vehicle arrives at the fleet’s location. With the reports these systems provide the fleet, problem tires are
Comments of American Trucking Associations  
Dockets EPA-HQ-OAR-2014-0827 and NHTSA-2014-0132  
October 1, 2015  

attended to before the vehicle sets out on its next trip, thereby dramatically reducing in-route breakdowns and optimizing the percentage of time tires are run properly inflated. In essence, a fleet is able to build its entire tire maintenance program around this technology and drastically improve its ongoing tire inflation maintenance. Therefore this technology has an even greater effect on fuel consumption and greenhouse gas emissions than the TPMS 1.0 systems which were proven to deliver 1.4% improvement in fuel economy by the FMCSA.

Due to the advances that have been made in TPMS 2.0 systems and the impact they have on fuel economy and greenhouse gas emissions, the Tire & Wheel (S.2) Study Group of ATA’s Technology and Maintenance Council (“TMC”) requests that TPMS 2.0 systems, tire pressure monitoring systems that are integrated with telematics, be included in the technology options provided under Phase 2. Without inclusion of this technology, there will be no system available in the TMC standard to address tire inflation pressure for powered vehicles since ATISs that are plumbed inside an axle (a market requirement by US fleets) are currently only available for trailers and an advanced technology that can seriously impact GHG emissions will be overlooked.

9. New Standards for Auxiliary Power Units will Increase Cost and Discourage Use

ATA is concerned that efforts to place additional emissions controls on diesel-fired auxiliary power units (APUs) will discourage the use of this fuel efficient technology. Currently, APUs are one of several alternatives to operating the main engine for ancillary power and cab comfort. And while APUs provide year-round comfort and fuel savings, as opposed to heat- or air conditioning-only systems, they tend to be at the higher end of the cost spectrum. Requiring additional emissions control technology will further increase the cost of this technology and likely discourage its use.

California currently requires diesel-powered APUs to be equipped with particulate filters when used on trucks with 2007 and newer engines. And while these filters are available, use has been limited primarily due to the additional cost and maintenance. Carriers who rely on APUs for fuel savings throughout the United States tend to forego their use in California in order to comply with the state’s unique filter requirements. This practice reduces the overall fuel savings benefit from an APU. ATA believes a further expansion of this type of requirement will have a negative impact on the use of idle reduction technologies and fuel efficiency.

For example, currently battery-powered APUs are another option. However, depending on a number of factors, including period of operation, ambient temperature, power demand, etc., this option may or may not meet a carrier’s ancillary power and cab comfort requirements during federally-mandated rest periods. By increasing the cost of one of the most common idle reduction technologies, diesel-powered APUs, solutions to reduce idling will become more limited. ATA recommends that EPA fully consider the potential impacts of increasing the cost of APUs on consumer acceptance, how such a cost increase will impact the cost-benefit assumptions used in the proposed rule, and what operational limitations may exist with other idle reduction technology option.
10. Research Must Confirm Safety of New-Generation LRRTs Before Market Entry

The safety effects of LRRTs are not totally understood. While the “…agencies analysis indicate that this proposal should have no adverse impact on vehicle or engine safety”, ATA remains leery of potential unintended consequences resulting from new generation tires that have yet to be developed. This especially holds true in terms of overall truck braking distances.

The trucking industry takes safety very seriously. With projected application rates for widely varied LRRTs for Class 7 and 8 trucks ranging from 10% to 60%, new truck purchasers will need to understand which applications may, or may not, be appropriate for these tires. We support all efforts to help maintain and advance our safety agenda. ATA is aware of Transport Canada’s November 2012 study on the winter traction performance of LRRTs on heavy-duty trucks. The analysis involved performance on packed snow as opposed to non-packed snow or ice. The conclusion of that preliminary study indicated that the then-current generation of SmartWay-verified LRRTs offered a similar level of snow traction performance as non-SmartWay-verified tires. Our concern rests in the fact that both Phase 1 and Phase 2 are pushing the limits of rolling resistance to new heights. To our knowledge there has not been any subsequent and comprehensive climatic testing on each new generation of LRRTs. Neither ATA nor your agencies wish to create any unforeseen safety consequences resulting from implementation under either Phase 1 or Phase 2. ATA requests testing and documentation of LRRTs under all weather conditions, including snow and ice, in advance of their entry into the marketplace. ATA asks both agencies, and NHTSA in particular, to ensure that each new generation of LRRTs and retreads not increase braking distances under all weather conditions.

11. Useful Life of LRRTs Must be Considered

LRRTs need to have improved wear rates such that our industry is not adversely impacting the environment by putting more casings into landfills and increasing natural resource use in manufacturing their replacements. The industry commonly sees a 40% reduction in useful life and a 20% reduction in casing life resulting from LRRTs. For example, wide-base single tires have shown poor tread wear in the tighter turning conditions of urban operations. This may result in higher wear-out rates if the rule encourages the use of wide-base single tires in these types of operations. When measuring efficiency improvements, it must be done with consideration of cradle-to-grave costs and consequences.

Few disciplines are as unforgiving as tire design. Engineer a tire for maximum grip and it may wear too rapidly; specify rubber that will deliver the best fuel economy and it may impact traction. With about 25 million new truck tires sold in the U.S. every year, extending the useful life of LRRTs not only represents a substantial savings of natural and synthetic rubber, but also reduces the fuel consumption and GHG emissions associated with production of their replacements. Lost in the Phase 2 discussions is the fact that it takes 23 gallons of oil to manufacture a new tire and only 8 gallons of oil to retread a tire.

12. **NHTSA Should Continue to Review and Analyze Potential Safety Impacts of Fuel Efficiency Technologies**

In June 2015, NHTSA published its *Review and Analysis of Potential Safety Impacts of and Regulatory Barriers to Fuel Efficiency Technologies and Alternative Fuels in Medium- and Heavy-Duty Vehicles.* This report undertook a safety analysis of medium- and heavy-duty vehicles equipped with fuel efficiency technologies and/or using alternative fuels (i.e., CNG, LNG, propane, biodiesel, and power train electrification). This peer-reviewed study included a comprehensive literature review, complemented with inputs from subject matter experts, and a scenario-based hazard analysis. Specific fuel efficient technologies examined included: Intelligent Transportation Systems and telematics, speed limiters, idle reduction devices, tire technologies (single-wide tires, TPMS and ATIS), aerodynamic components, longer-combination vehicles, and light-weighting materials. Federal and state safety regulations and voluntary technical standards affecting fleet adoption rates of fuel efficient technologies and alternative fuels were discussed, as were potential regulatory barriers. The findings, while based on literature reviews up through 2013 and prior to the implementation of Phase 1, suggest that potential safety hazards identified can be prevented or mitigated by complying with safety regulations, voluntary standards, and industry best practices. The study did not identify any major regulatory barriers to rapid adoption of fuel efficient technologies and alternative fuels by both medium and heavy-duty fleets.

ATA is pleased that NHTSA has undertaken such a study and asks that DOT’s Volpe National Transportation Systems Center continue to assess and evaluate potential safety impacts that may be attributed to the use of fuel efficiency devices. ATA recommends that regular updates and publication of results be undertaken on an established schedule as determined by NHTSA but not less frequent than once every three years. Such analysis should build upon the technologies already identified under the 2015 report and should be expanded to include warranty claim reviews as well as fleet interviews and surveys.

13. **Need for Harmonization Between State and Federal GHG/Fuel Economy Programs**

The proposed rule notes that EPA and NHTSA have been consulting with CARB to “enhance the potential for the Phase 2 program to result in a National Program that can be adopted not only by the Federal agencies, but also by the State of California.” ATA supports these efforts as harmonization with California (or other states for that matter) is an extremely high priority. Given the interstate nature of trucking, national consistency in regulatory approaches is critical.

It is both unwise and unhealthy for the nation’s economy and the movement of the nation’s freight to allow a patchwork of state and federal tailpipe and fuel consumption standards for trucks to emerge. It is critical for EPA, NHTSA, CARB, and the other 49 states to closely coordinate their efforts. CARB’s adoption of the GHG and fuel efficiency standards for the Phase 1 rule and for model year

---

2017-2025 cars and light-duty trucks is a positive step in this direction. However, initial indications suggest differences between CARB’s desires and the proposed federal standards.

For example, CARB’s Sustainable Freight Plan indicates the potential to harmonize with parts of the federal Phase 2 proposal (emphasis added) and contends that California-only actions could lead the way for later nationwide progress. More recently, CARB’s July 2015 update on the proposed federal Phase 2 standards indicates differing viewpoints on the timing, technology, and scope of the federal Phase 2 rule and concludes that a California Phase 2 proposal may include California-only elements.

ATA is very concerned that while the goal of harmonization is being promoted, unified efforts to achieve this goal are lacking. ATA would like EPA and NHTSA to take proactive steps to ensure that national interests are pursued as opposed to specific state or agency agendas. In order to do this, EPA and NHTSA must identify where differences exist among regulatory agencies and provide strong technical justification for why the approach taken in the final rule is in the best interest of promoting national uniformity and economic prosperity. This justification should emphasize the benefits a national approach brings to not only the environment, but also to vehicle and engine manufacturers and the trucking industry as a whole. EPA and NHTSA should provide a clear explanation of the context and circumstances which support the final standards when compared to other suggested regulatory approaches.

14. Drive Cycle Weightings Need to be Re-Evaluated

The proposed rule indicates drive cycle weightings of 5% of the transient cycle, 9% of the constant speed 55 mph cycle, and 86% of the constant speed 65 mph cycle for sleeper cabs. For day cabs, the weightings are 19% of the transient cycle, 17% of the constant speed 55 mph cycle, and 64% of the constant speed 65 mph cycle. ATA believes these weightings are not reflective of real world operations and tend to overestimate the benefits of certain technologies, such as aerodynamics and rolling resistance, and potentially discount others.

As discussed in Appendix 2, using 3.6 million spot speed records collected from throughout the U. S. during the month of May 2015, trucks operated at speeds of 55 mph or greater 57% of the time. This is significantly lower than the weightings being used by EPA (95% of the time for sleeper cabs and 81% of the time for day cabs). As shown below, the benefits from a 20% reduction in the aerodynamic drag coefficient (“Cd”) diminishes as speed decreases. The power loss (and benefits) associated with the rolling resistance coefficient (“Crr”) of tires also diminishes as speed decreases.

---

14 California Air Resources Board, Public Meeting Agenda for July 23, 2015, Item #15-6-6: Public Meeting to Update the Board on Proposed Federal Phase 2 Greenhouse Gas Standards for Medium- and Heavy-Duty Engines and Vehicles, Staff Presentation.
15 Federal Register, p. 40242.
Aerodynamic and tire power losses for tractor-van trailer combination

Given the relationship between vehicle speed and technology benefits, it is imperative that EPA and NHTSA develop drive cycle weightings that are representative of real-world operating conditions. The agencies should consult with the American Transportation Research Institute to determine how available data can be used to characterize the speeds at which trucks actually operate and incorporate this information into the speed weightings and technology assessments.

15. Credit for Use of Vehicle Speed Limiters Needs to be Expanded

In addition to safety benefits, reducing speed is a proven way to decrease GHG emissions and fuel consumption. To this end, ATA filed a petition with NHTSA and the Federal Motor Carrier Safety Administration (“FMCSA”) in October 2006 requesting a rulemaking to require vehicle manufacturers to limit the speed of trucks with a gross vehicle weight rating greater than 26,000 pounds to no more than 68 mph. In response to this petition, a joint rulemaking has been initiated which will require the installation of speed limiting devices on heavy trucks. This rulemaking is currently undergoing review at the Office of Management and Budget.

While the details of this rulemaking have not been released, it appears that vehicle speed limiters (“VSLs”) will be mandatory equipment on new trucks within the timeframe of the Phase 2 standards. This rulemaking will likely establish new parameters for VSLs which should be accounted for in the final rule. For example, the rulemaking is expected to establish a maximum limited speed. This speed should serve as the baseline and may be different than the current baseline Greenhouse Gas Model (“GEM”) input of 65 mph. Depending upon where the maximum is set, credits should be reflective of speed adjustments below this level.

\[16\] National Research Council, Transportation Research Board, Technologies and Approaches to Reducing the Fuel Consumption of Medium- and Heavy-Duty Vehicles (2010).
The fact that VSLs are not being used as a compliance strategy despite being widely used among trucking companies is concerning. It appears purchasers are not willing to accept the tamper-proof requirement associated with this technology and instead opt to use them on their own terms. The agencies should explore ways of incorporating the in-use benefits being derived from VSLs. To this end, a more workable solution which provides credit for ordering a new tractor with VSL should be pursued. Possible approaches could include:

- Allowing manufacturers to accept a purchaser’s commitment to establish a maximum limited speed, as opposed to the tamper-proof option, when acknowledged and affirmed on a vehicle’s purchase agreement.
- Allowing manufacturers to adjust VSLs at the end of a vehicle’s lease or trade-in and allow the creation of deficits or credits if such adjustments affect the initial credits which were generated.
- Allowing trucking companies to adjust maximum speeds if company policies change during the ownership cycle with corresponding adjustment to manufacturer credits.

The agencies should work with truck manufacturers and their customers to identify potential mechanism which will allow the practice of using VSLs be more accurately quantified under the final rule.

16. Further Evaluation and Demonstration is Needed Before Committing to a Low-NOx Engine Standard

Having gone through three rounds of reducing tailpipe NOx emissions in 2004, 2007, and again in 2010, the lessons learned from these prior regulatory actions remain fresh in the minds of the industry. Fuel economy penalties, increases in greenhouse gas emissions, reliability issues, and vehicle pre-buys and low-buys were among the significant unintended consequences. Another major factor was the cost of compliance. The cumulative vehicle surcharge for all three rounds was in excess of $21,000, more than four times EPA’s projected cost of compliance.\textsuperscript{17} Given EPA expects fleets to pay an additional $14,000 for a new tractor-trailer combination meeting the Phase 2 standards, the agencies must be sensitive to the cost impacts additional regulatory pursuits will have on the trucking industry.

Although CARB recently certified an 8.9 liter natural gas engine to an optional NOx standard of 0.02 g/bhp-hr, the ability to transfer this technology into the Class 8 truck sector remains unproven.\textsuperscript{18} The prospect of a commercially viable diesel engine meeting a NOx standard that is as much as 90% below the current standard should not be a foregone conclusion. As identified in the proposed rule,\textsuperscript{19}

\textsuperscript{17} Calpin, Patrick & Esteban Plaza-Jennings, A Look Back at EPA’s Cost and Other Impact Projections for MY 2004-2010 Heavy-Duty Truck Emissions Standards, American Truck Dealers (February 2012).
\textsuperscript{18} CARB Webpage: Heavy-Duty Engines and Vehicles, including Urban Buses, and Engines Used in Diesel or Incomplete Medium-Duty Vehicles of 8501-14000 Pound GVWR Executive Orders – 2016, \texttt{http://www.arb.ca.gov/msprog/onroad/cert/mdehdehdv/2016/2016.php}
\textsuperscript{19} Federal Register, p. 40205.
If system designers push the NH$_3$ to NOx ratio higher to try and achieve the maximum possible NOx reduction, it could increase N$_2$O emissions. If EPA were to adopt a very low NOx standard (e.g., 0.02 g/bhp-hr) over existing test cycles, some reductions would be needed throughout the hot portion of the cycle (although most of the reductions would have to come from the cold start portion of the test cycle). An increase in NH$_3$ to NOx ratio could also further reduce NOx emissions; however this would also adversely affect NH$_3$ slip and N$_2$O formation.

ATA is aware of the CARB-led research taking place at Southwest Research Institute to investigate the feasibility of achieving lower NOx emissions. While this evaluation is scheduled to be completed in late 2016, additional time will be needed to further develop and demonstrate any resulting technologies. In addition to the need to demonstrate the technical feasibility of meeting lower NOx emissions in the Class 8 sector, while at the same time achieving increasingly stringent GHG emission limits, the in-use performance of such an engine must be carefully evaluated to ensure it meets the reliability, performance and cost criteria of the purchaser. Otherwise, this pursuit will result in buyer avoidance and an increase in the overall age of the fleet. ATA recommends that EPA carefully evaluate the cost, timing, and market readiness of emerging low-NOx technologies when considering requests for a low-NOx engine standard.

### 17. Manufacturers Should not Limit Vehicle Purchasing Options

OEM’s will comply with the rule by selling more efficient engines, tractors, and trailers. Shortfalls in meeting their targets can be supplemented with either early introduction or over-compliance credits. The trucking industry is very diverse and vehicles and trailers are traditionally ordered with equipment tailored for specific applications. As under Phase 1, ATA and its member fleets remain concerned that certain equipment the industry has relied upon by the industry may no longer be manufactured and offered for sale due to their lower overall efficiency numbers. If such a scenario does in fact play out, fleets may be forced to purchase equipment that is, in fact, less efficient since the equipment is no longer properly paired with its specific work application.

This scenario is a real concern for the trucking industry. Fleets want to be assured that the vehicles they purchase are best-suited for their needs. Trucking customers are so specific with their truck orders that they would rather wait to get the exact truck they need than take what is available. In a worst-case scenario, a fleet may explore the newer, used truck market or extend their normal trade-in cycles. This situation has occurred recently with the elimination of cab-over tractors. Companies that were employing these tractors, in many cases to comply with vehicle length limitations, have been forced to extend the life of their existing tractors and forego vehicles with advanced emissions controls, or reconfigure to shorter trailers, resulting in more truck trips. Technologies that add additional weight to a truck and/or increase a company’s capital costs without optimizing fuel consumption and GHG reductions will reduce the potential benefits of the rule.

---

18. NHTSA Should be Aware of Potential Weight Implications of Regulating Under-Ride and Over-Ride Guards

In July 2015, NHTSA issued an Advanced Notice of Proposed Rulemaking pertaining to rear impact (under-ride) guards and other safety strategies for single unit trucks. NHTSA also indicated that it will issue a Notice of Proposed Rulemaking focusing on rear under-ride guards on trailers. Further, NHTSA noted that it is still evaluating a petition request to improve side under-ride and front over-ride guards for all trucks and will issue a separate decision on those issues at a later date.

A measure included under Phase 2 to advance trailer fuel efficiency promotes the use of lighter weight materials in their construction (i.e., decreasing trailer weight will allow for the substitution of additional freight weight). NHTSA must remain aware that if the pending petition on side under-ride and front over-ride guards is granted, such new standards will increase tractor, trailer, and straight truck weights. While NHTSA and EPA give OEMs credit for selling new, light-weight equipment under Phase 2, light-weighting gains could be quickly overcome by the added weight attributed to the addition of new side under-ride and front over-ride guards. Likewise, new requirements for rear under-ride guards will likely result in increased weights attributed to the use of stronger materials used in their construction.

19. Natural Gas Vehicle Development and Deployment Must not be Stymied

Natural gas still remains the most promising alternative fuel available to the trucking sector. The continued interest and investment in both vehicles and infrastructure, both in the public and private sectors, has clearly indicated the potential of natural gas as a transportation fuel. Continued research and improvements in both the efficiency and performance of such vehicles continues to grow. ATA submits the following comments specific to the use of natural gas under the proposed rule:

a) In-Use Natural Gas Fuel Standards Should be Addressed Outside of the Rule

Several standards organizations currently are in the process of reviewing fuel specifications for natural gas used as a motor fuel and may finalize such a standard in the future. SAE J1616 currently addresses fuel specifications for natural gas motor fuel but is a recommended practice, not a required standard. Based on the current level of discussion and level of usage of natural gas as a transportation fuel it is not clear whether the current discussions will result in any changes to J1616 or a new fuel standard for natural gas. Given that these discussions are currently ongoing, it would be premature for EPA to propose a standard.

b) Natural Gas Carbon Footprint Should Exclude Upstream Emissions

ATA supports the long-standing practice of only regulating tailpipe emissions as opposed to accounting for the life-cycle carbon footprint associated with natural gas combustion. Assessing and determining upstream emissions is an extremely complicated undertaking. State and federal regulations are, or will soon, address upstream carbon emissions both at production and distribution networks. Therefore, we support the decision not to include upstream emissions in the standards used to regulate motor vehicles and engines.
c) Industry is Better Situated to Determine LNG Tank Hold-Times

EPA has proposed adopting industry standard SAE J2343 which requires a 5-day hold-time for natural gas tank boil-off on vehicles powered by LNG. ATA supports the decision of EPA to defer to, and reference, industry standards relating to hold-times for LNG tanks. The current standards address concerns related to emissions from natural gas vehicles that could be parked for long periods of time without use. Concerns related to vehicles that are parked and unused for longer periods of time can, and should be addressed by operational practices such as starting the vehicle for a short period of time to relieve pressure, or scheduling to ensure that vehicles do not remain parked for long periods of time. Compliance demonstrations of the 5-day hold-times should be the responsibility of tank manufacturers or fuel system packagers.

20. Use of Advanced Technology Credits Should Continue

Hybrid and electric technology applications continue to be of interest to the trucking industry, especially in the vocational segment. While these technologies provide fuel savings and reduced tailpipe emissions, the cost of these technologies can be substantial. EPA estimates the added cost of hybrid technologies are in the range of $20,000 to $40,000 for larger vocational vehicles and tractors while full electric technologies are in the $50,000 to $150,000 range. These costs are the highest of all the fuel efficient technologies identified and, as previously discussed, are likely to result in lower adoption rates than estimated.

In order to continue to advance these technologies and their adoption, the incentive-based approach used in Phase 1 should be retained. Specifically, the agencies should preserve the advanced technology credits which provide a credit of 1.5 in order to promote the use of hybrid and electric vehicles in larger vocational vehicles and tractors. A continuation of these credits will provide an incentive for OEM’s to pursue the development and sale of hybrid and electric vehicles. These credits will likely help drive down costs while more effectively promoting the advantages of this green-technology path as a path towards achieving the goals of the rule.

21. Trailer Concerns

While ATA recognizes the potential for fuel-efficiency gains from improved trailer design, ATA commends the agencies in affording trailer OEMs flexibility in achieving new trailer efficiency targets. The trailer manufacturing industry is far different from the engine and truck manufacturing sectors. Whereas there are only a handful of truck and engine manufacturers, there are well over 100 trailer manufacturers in the U.S. with the vast majority being designated as small businesses. The top 10 trailer manufacturers account for over 75% of total sales. Unlike the business relationships between engine and truck manufacturers, trailer manufacturers remain separate and unique entities.

Trailers come in a variety of different styles including dry vans, refrigerated, tank, flat bed, and specialized to name a few. The ratio of trailers to tractors is 3:1 or more and tractors are often paired with a variety of different trailer types depending on a company’s operations. Adding another level of
complexity to the equation, the useful life of a trailer can exceed 20 years with proper maintenance and even be remanufactured to provide many more years of useful life.

Having just surpassed the 100-year anniversary of the semi-trailer, ATA agrees that it is time to reassess trailer design elements including use of LRRTs, aerodynamic devices, tire pressure technologies, and light-weighting. Trailer regulation should be nationally harmonized and not done in a piecemeal manner such as CARB has done. As a key stakeholder, ATA desires to work with the agencies in developing a logical and cost-effective approach in developing a national trailer efficiency improvement program.

ATA’s specific comments relating to trailers are as follows:

a. **Consideration Should be Given to Exempt Certain Trailers from Using ATISs**

Certain tires loads, especially on heavy-hauls, have working tire pressures exceeding the capabilities of on-board compressors. Additional on-board compressor tanks can cost $800 and add an additional 150 pounds of weight. Consideration should be given to exempt certain trailers from using ATIS and instead allow the use of TPMS as previously discussed.

b. **Light-Weighting Must Account for Additional Weight and Impacts on Durability**

Light-weighting is included as an efficiency improvement option for trailers. Whether the additional weight attributed to add-on trailer technologies – such as aerodynamic skirts – is accounted for in the fuel savings estimate figures needs clarification. In addition, any consideration to further expand current menu technology credits for trailer light-weighting should assess and disclose how such measures impact trailer durability and useful life.

c. **Drop-Floor Trailers Should be Afforded Efficiency Credit**

It remains unclear whether the agencies have considered the aerodynamic benefits of drop-floor trailers in their menu options. If such credits are not presently accounted for, ATA asks that such credits be added for all box-trailer categories.

d. **Establishing a Trailer ABT Program Will Provide Fleets More Flexibility**

ATA supports the use of Averaging, Banking, and Trading (“ABT”) by trailer OEM’s for a number of reasons. Fleets are wary of each trailer having to achieve a given compliance standard. As mentioned throughout these comments, maintaining fleet flexibility in spec’ing equipment is vital for our industry. Fleets are best situated to determine what combinations of technologies perform effectively within their operational models and financial means. While it is certainly more convenient to conduct trailer compliance audits if each and every trailer were to hit a specific efficiency target, averaging will help maintain flexibility in purchasing decisions and promote greater acceptance.
e. Fleets Should not be Forced to Invest in Inefficient Trailer Technologies

Fleets should not be forced to purchase specific technologies only in the name of OEM compliance if such technologies do not add benefit to a fleet’s operations. To pigeon-hole fleets into making financial investments on equipment that is ill-suited to their operations is not a good business model or good government.

f. In-Use Trailers Should be Used in Establishing Compliance Baseline

The trailer efficiency improvements use a baseline 2017 SmartWay trailer. In-use trailers at the time would be a more representative baseline figure.

g. Additional Trailer Exclusions are Needed for:

**Jeep, Dolly, and Load Divider:** A trailer composed of a trailer chassis and one or more axles, with no solid bed, body, or container attached, and which is designed exclusively to support a portion of the load on a trailer or truck.

**Heavy-Haul:** Any trailer that has a gross vehicle weight rating (“GVWR”) of more than 120,000 pounds or any trailer equipped with an axle that has a gross axle weight rating (“GAWR”) of 29,000 pounds or more.

**Expandable:** Any trailer that has a width of more than 102.36 inches with extendable equipment in the fully retracted position and is equipped with two short track axles in a line across the width of the trailer.

**Extendable:** Any trailer that has air lines designed to allow extension of the vehicle frame or load deck.

**Modular:** Any trailer that has air lines designed to allow separation and removal of deck sections or insertion of deck sections to create longer or shorter load carrying areas.

**Sliding:** Any trailer that has an undercarriage system designed to move forward or back to allow the load deck to tilt, slide, or adjust into a position that facilitates the loading or unloading of equipment but must return to original position for transport.

**Multi-Axle:** Any trailer that has two or more permanently attached axles (including lift axles) and designed to accept additional removable axles, flip axles, and/or load transferring boosters; both mechanical, hydraulic, or air (or other gas).

**Dump:** An open-topped trailer having a load-bearing container body structure with a hydraulic cylinder that allows the container to be tilted to discharge its contents through an open tailgate that is used in short-haul transport of construction, paving, demolition and other bulk materials such as sand, gravel, asphalt, sludge, scrap metal, farm products etc., from off-road mine/pit loading sites to off-road construction unloading sites.
Refuse Transfer: A usually open-topped trailer having a load-bearing container body structure that can be tilted on an external hydraulic tipping platform or equipped with a self-unloading floor to discharge its contents through an open tailgate that is used in short-haul transport of refuse material (garbage) from off-road transfer station loading sites to off-road landfill unloading sites.

Lift Gate Equipped: Rail lift and lift gate equipped trailers operate at low speeds and perform local deliveries. As such, they ought to be classified as “non-aero” based solely on the inclusion of a lift.

Multi-Temp Food Service: Typically has a compartment in the nose of the trailer that takes up the full width with two narrow compartments behind it. The two narrow compartments can be unloaded through the rear door but the front compartment requires unloading through a side door.

Roll-Up Doors: Trailers utilizing rear roll-up doors should be given a partial or qualified exclusion from the aerodynamic requirements until an effective, durable and cost efficient product is available which is compatible with these types of rear frame designs.

22. A Contingent Mid-Course Review Should be Incorporated into the Final Rule

Regulating heavy-duty vehicles is far more complex than that of light-duty vehicles. As such, it is imperative upon the agencies to ensure the multiple fuel efficiency milestones set out for trailers, engines, and vehicles under Phase 2 proceed in an achievable and orderly manner. ATA therefore strongly urges the agencies to undertake a mid-course review during the implementation process if warranted.

Mid-course reviews are not unfamiliar to the agencies. EPA and NHTSA endorsed a mid-course review process under the Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards for MY 2017-2025. Such a review can determine whether the multiple standards remain appropriate in light of technological and other changes that may have occurred since the time of proposal. A mid-course evaluation, if necessary, would include consideration of the state of technology development, technology and fuel costs, market penetration rates, national harmonization of standards, the state of the national economy and the trucking industry, safety considerations, impacts of superseding regulatory or legislative activities, other factors considered by the agencies in setting the standards, and the expected impact of those factors on the OEMs ability to comply.

Of critical importance are the event or events that would trigger such a review. One such trigger would be finalizing any new state and/or federal NOx or PM emission standards for medium and heavy-duty engines and vehicles during the implementation period under Phase 2. Additional standards triggering an evaluation would include state-specific deviations from Phase 2; widespread OEM non-compliance due to impossibility (including agency miscalculations in technology market penetration rates, equipment cost estimates, economic factors, and other matters resulting in the
agencies not achieving their respective GHG and fuel efficiency goals and objectives as set out under the final rule).

If triggered, a mid-course review should be pursued as expeditiously as possible while ensuring any modifications to the standards enacted by the final rule are consistent with the lead time and stability requirements of the Clean Air Act (42 USC §7521(a)(3)(C)). Using the Light-Duty Rule as a guide, EPA and NHTSA should prepare and publish a draft Technical Assessment Report that should be peer-reviewed and made available for public comment. The agencies should also solicit comments on whether the standards and specific targets are being achieved. If the agencies conclude that the standards are not being achieved or likely will not be achieved due to some triggering effect, the agencies will initiate a rulemaking to revise the original standards, as appropriate under Section 202(a), and issue a joint rulemaking at least 18 months prior to the beginning of the next full model years of regulated equipment.

A mid-course review is more than just appropriate; it is a critical component of this rulemaking package if these standards are to be successful. Phase 2 will govern vehicle production 12 years from now and beyond, a particularly long time period when predicting the state of technology development, equipment costs and durability, maintenance issues, driver satisfaction, fuel pricing and consumption levels, consumer behaviors, the state of the economy and the trucking industry, other state and federal regulatory and legislative requirements, and future equipment build rates. As we are just beginning implementation under Phase 1, the trucking industry is now tasked with assessing potential impacts and feasibility under Phase 2, along with the real possibility of a Phase 2 conflict that will likely occur as a result of CARBs upcoming revisions to its truck GHG efforts.

The Phase 2 effort and expense will further our country’s energy and environmental goals, but only if fleets choose to purchase these fuel-efficient, climate-friendly vehicle technologies. Any mid-course evaluation will allow the agencies to determine whether the standards are in fact achievable and make appropriate changes to ensure that progress in reducing GHGs and saving fuel will proceed based upon the multitude of factors that can impact the original targets established in 2016.
Comments of American Trucking Associations
Dockets EPA-HQ-OAR-2014-0827 and NHTSA-2014-0132
October 1, 2015

CONCLUSION

Trucking is, and will remain, the predominant means of moving the nation’s freight. *Without Trucks America Stops*. In fact, by the year 2020, 71% of freight transportation tonnage will be delivered by a truck. We wish to move our goods in the most cost-effective and fuel-efficient manner. To achieve this end, we ask both EPA and NHTSA to work closely with ATA to ensure the successful implementation of this critical rulemaking. ATA stands ready to assist in this historical undertaking. If you have any questions concerning these comments, please contact me at 703-838-1879 or gkedzie@trucking.org.

Respectfully submitted,

Glen P. Kedzie
Vice President, Energy & Environmental Counsel
American Trucking Associations
APPENDIX 1

ATA FUEL EFFICIENCY ADVISORY COMMITTEE
GUIDING PRINCIPLES

The Fuel Efficiency Advisory Committee (FEAC) was formed in the Summer of 2013 to offer perspectives and provide guidance to ATA on the EPA/NHTSA Greenhouse Gas & Fuel Efficiency Standards for Medium and Heavy-Duty Trucks (Phase 2). The FEAC is comprised of a broad cross-section of ATA fleet members including: representatives from truckload and less-than-truckload carriers; medium and heavy-duty truck operators; small, medium, and large-size fleets; and members from ATA’s Environmental & Energy Policy Committee, Technology & Engineering Policy Committee, and Technical Advisory Group. In addition, due to the role trailers will play in Phase 2, a representative from one of the country’s leading trailer manufacturers has participated on the FEAC.

The FEAC drafted, and ATA adopted, the following Guiding Principles to be used in developing the industry’s positions on Phase 2:

- Advance Greenhouse Gas and Fuel Consumption Reductions that are Based Upon Sound Science and that are Economically Achievable
- Standards Should Reflect Real-World Benefits Through Test Methods and Input Variables that Most Accurately Replicate Real-World Duty-Cycles
- Phase 2 Should not be Based On Technology-Forcing Standards
- Return on Capital Investments Should not Exceed 18 Months and Should be Based on Real World Benefits
- Phase 2 Should be Consistent with Phase I Relative to Current OBD Requirements
- Phase 2 Should not Result in Unintended Consequences Involving Safety or Increases in Emissions of Other Pollutants such as Nitrogen Oxides (NOx)
- State Requests to Further Reduce NOx Emissions Should not Compromise Carbon Reduction and Fuel Consumption Targets
- EPA Should Seek to Harmonize the California Air Resource Board’s Truck Greenhouse Gas Standards with the Phase 2 Standards
Comments of American Trucking Associations  
Dockets EPA-HQ-OAR-2014-0827 and NHTSA-2014-0132  
October 1, 2015

- Compliance and Enforcement Under Phase 2 Should be Expressly Defined as Being the Responsibility of OEM’s

- Ensure OEM and Fleets Maintain Flexibility In Technology Paths and Equipment Purchase Choices

- Ensure OEM’s Maintain Flexibility in Accumulating, and Utilizing Compliance Credits

- Provide OEM’s Sufficient Lead Time and Stability for Research and Development

- If Trailers are Included under Phase 2, Limit Regulation to 53’ Box Trailers, Account for Tractor-Trailer Ratios in Determining Costs and Benefits, and Maintain Current Tractor-Trailer Interchangeability (*NOTE: ATA has subsequently endorsed consideration of certain non-box, <53’, and chassis trailers*)

- Diesel Fuel Should be the Baseline Fuel Used in Phase 2 Methodologies

- OEM’s Should be Permitted to Use Alternative-Fueled Vehicles and Any Respective Greenhouse Gas/Petroleum Fuel Reductions as Credits in Achieving Phase 2 Targets
APPENDIX 2

SPOT SPEED DATA

Since 2002, the American Transportation Research Institute (ATRI) has led the Freight Performance Measures (FPM) program which evaluates the effectiveness of the highway system to facilitate fast, efficient goods movement.

Performance measurements are produced for this program through the use of real, anonymous, private sector truck data sourced through unique industry partnerships. ATRI’s FPM database currently contains billions of truck data points from several hundred thousand unique vehicles spanning 10 years. These data, which include periodic time, location, speed and anonymous unique identification information, are used by ATRI researchers to produce the following:

- Average speed, travel time and reliability of truck movement on large transportation networks such as the Interstate Highway System.
- Quantification and ranking of highway bottlenecks, urban congestion and localized system deficiencies on the nation’s freight transportation system.
- Crossing time and delay statistics at freight significant U.S./Canadian border crossings.
- Information describing demand for truck routes and highway facilities throughout the U.S.
- Assist in development of anonymized origin-destination truck trip models and tables.

ATA asked ATRI to conduct a preliminary analysis of truck speeds using the FPM database. ATRI analyzed data for each day, 24 hours a day, for one month, May 2015, for trucks operating throughout the U.S. This analysis generated a total of 3.6 billion spot speed records which were analyzed and divided into 1 mph speed bins. The vast majority of these records were generated from Class 8 trucks.

This methodology generated data, displayed in the following graph, which characterizes the frequency of spot speeds for trucks operating in the U.S. during the month. The graph is based on data collected when a vehicle is in motion. As shown in the graph, speeds with frequency distributions of 2% of more occurred from 56 to 67 mph.
Overall, speeds of 55 mph and greater accounted for slightly more than half, 57%, of the moving truck speeds collected for the month. Individual speed bins below 55 mph accounted for relatively small percentages individually; however, when accumulated over the course of the month among the hundreds of thousands of vehicles in the dataset, these speeds represent a fairly large portion of the overall operating speeds of Class 8 trucks.
APPENDIX 3

CARBs REVIEW OF WARRANTY CLAIM REPORTS

c. Review of Warranty Claim Reports

➢ Key Finding: Warranty claims for engine components suggest engine durability is a concern that can impact PM filter performance.

As discussed in Section 5, engine and retrofit manufacturers are required to submit warranty claims data over the first 100,000 and 150,000 miles of operation, respectively, to ARB to meet certification and verification requirements. Each warranty claim represents an incident where a vehicle operator took that vehicle out of service and to a maintenance facility, and the part under warranty was replaced. The replaced part may or may not have been defective, and the process for determining whether the replaced part was defective is called a screening process. Warranty claims reported by manufacturers to ARB are unscreened, meaning the components replaced may not have actually been defective. Staff considers an unscreened claim rate, the number of claims for an engine family divided by its sales, to be high when it exceeds 10 percent, a threshold that triggered automatic corrective action under the 2007 EUIK regulations before they were overturned by the Los Angeles Superior Court in December 2008.24

Table 1 reports unscreened warranty claims for new HHD engines by engine MY. The table shows unscreened warranty claims rates exceeding 10 percent for injectors, turbochargers, EGR units, EGR coolers, SCR, and PM filters. The table also shows that warranty claims increased in MY 2003-2004 and 2007 when new emissions standards took effect. For example, EGR claims increased in 2004 and 2007, and decreased between 2004 and 2006, and between 2007 and 2011. MY 2011 engines have the lowest overall warranty claims rate since MY 2003, reflecting the on-going maturation of technology since 2007 and 2010 standards took effect. Despite this decline in engine component warranty claims for MY 2011, five component groups still exceed 10 percent unscreened warranty claims rates: injectors, EGR systems, EGR coolers, SCR systems, and other engine components. Preliminary warranty reports for MY 2012 engines suggest better performance and lower overall warranty claim rates than for MY 2011 engines; however, because many MY 2012 and newer engines are still covered under manufacturer emission warranties, staff cannot assess the trends for specific component groups beyond the reported period.

A close examination of the warranty claims suggests upstream engine components could be the root cause of PM filter problems, as shown in Figure 4. Virtually all engine families with reported claims for the PM filter also had reported claims for another engine-related component. A total of 208 heavy-duty diesel engine families were sold between MY 2007 and 2011; of these, 127 engine families reported warranty claims for an upstream engine component, of which 77 had claims reported for an emissions related component and the PM filter, where 44 engine families reported claims for an emissions related component and not the PM filter, and only 6 reported claims for the PM filter alone.
Retrofit PM filter systems are warranted for five years or 150,000 miles of operation, which is a longer warranty period than for OE PM filters. Retrofit PM filters have a 10 percent warranty claim rate. However, most of these claims are for sensors replaced under warranty; manufacturers report a warranty claim rate for retrofit diesel PM filter core replacement of 0.5 percent.

Table 1. Heavy-Heavy Duty (HHD, >33,000 lbs GVWR) Unscreened Warranty Claim Rates by Component Group for MY 2003-2011 Engines.

<table>
<thead>
<tr>
<th>Component Group</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injectors</td>
<td>6%</td>
<td>67%</td>
<td>8%</td>
<td>3%</td>
<td>8%</td>
<td>12%</td>
<td>40%</td>
<td>22%</td>
<td>14%</td>
</tr>
<tr>
<td>Engine / ECM / Other</td>
<td>16%</td>
<td>30%</td>
<td>22%</td>
<td>22%</td>
<td>90%</td>
<td>59%</td>
<td>32%</td>
<td>17%</td>
<td>11%</td>
</tr>
<tr>
<td>Turbocharger Related</td>
<td>15%</td>
<td>38%</td>
<td>22%</td>
<td>25%</td>
<td>18%</td>
<td>12%</td>
<td>17%</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>EGR</td>
<td>26%</td>
<td>42%</td>
<td>35%</td>
<td>33%</td>
<td>41%</td>
<td>44%</td>
<td>31%</td>
<td>12%</td>
<td>10%</td>
</tr>
<tr>
<td>EGR Cooler</td>
<td>30%</td>
<td>12%</td>
<td>5%</td>
<td>6%</td>
<td>15%</td>
<td>14%</td>
<td>21%</td>
<td>20%</td>
<td>14%</td>
</tr>
<tr>
<td>Exhaust Manifold</td>
<td>10%</td>
<td>0%</td>
<td>7%</td>
<td>1%</td>
<td>0%</td>
<td>1%</td>
<td>4%</td>
<td>4%</td>
<td>4%</td>
</tr>
<tr>
<td>DOC</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>2%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>PM Filter Related</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>35%</td>
<td>18%</td>
<td>7%</td>
<td>8%</td>
<td>4%</td>
</tr>
<tr>
<td>SCR Related</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>20%</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>Total HHD Sales</td>
<td>6487</td>
<td>5499</td>
<td>8889</td>
<td>7535</td>
<td>3524</td>
<td>4729</td>
<td>4062</td>
<td>2698</td>
<td>5232</td>
</tr>
</tbody>
</table>

ECM = engine control module, DOC = diesel oxidation catalyst, SCR = selective catalytic reduction
(*) Engine standard change: 2004, 2.5 g NOx+HC/bhp-hr; 2007, 0.01 g PM/bhp-hr; 2010, 0.02 g NOx/bhp-hr.
(--) Control technology not applicable for these model year ranges.