



Office of the President

TENNESSEE TECH

June 15, 2017

The Honorable Diane Black
1131 Longworth HOB
Washington, DC 20515

Reference: Tennessee Tech University – Summary of Heavy Duty Truck Study and Evaluation of the Phase II Heavy Duty Truck Rule

Congressman Black:

From September 2016 – November 2016, the Tennessee Technological University Department of Civil and Environmental Engineering (“Tennessee Tech”) conducted the first phase of its research on the environmental and economic impact of the Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles – Phase 2 rule (“Phase 2 Rule”) published October 25, 2016. The key areas of research were to (1) Compare Glider Kit compliance with the Phase 2 Rule; (2) Perform high level environmental footprint and economic study of OEM manufacturing vs. assembly of remanufactured components (Glider Kits); and (3) Evaluate industry optimization plans to address future environmental regulations including but not limited to production vehicles, component assembly, and facility compliance.

To carry out the environmental footprint component of the research, Tennessee Tech tested thirteen heavy-duty trucks on a common chassis dynamometer at a common site; eight trucks were remanufactured engines and five were OEM “certified” engines, all with low mileage (NOTE: These Base Line Setting Phase I results were completed by testing only one Glider Kit manufacturer’s product and one OEM’s product). Each vehicle was evaluated for fuel efficiency, carbon monoxide (CO), particulate matter (PM) emissions and nitrogen oxide (NO_x). The results of the emissions test were compared with the 2010 EPA emissions standards for HDVs. Our research showed that optimized and remanufactured 2002-2007 engines and OEM “certified” engines performed equally as well and in some instances out-performed the OEM engines. (see also Appendix A for more detailed test results).

Summary Chart of Phase 1 Test Results	
Emission Standard	Result
CO	All vehicles met the standard
PM	All vehicles met the standard
NO _x	None of the vehicles met the standard

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While none of the vehicles met the NO_x standard, a glider remanufactured engine achieved the best result of any engine tested (see Appendix A). Further, our research showed that remanufactured and OEM engines experience parallel decline in emissions efficiency with increased mileage. Contrary to the assertion in the Phase 2 Rule, it is our estimate that the glider kit HDVs would emit less than 12% of the total NO_x and PM emissions, not 50%, for all Class 8 HDVs. Should the Phase 2 glider cap be fully implemented on January 1, 2018, there is little doubt that consumers utilizing glider vehicles, due to economic considerations, will delay purchasing new equipment and consequently, slow the reduction of engine emissions nationwide. In this regard, the Phase 2 rule is counter-productive to its stated intent.

In addition to equal or lower emissions, glider kits have a smaller carbon footprint than OEM vehicles due to fuel efficiency and recycling of materials. Comparisons between 2016 glider kit vehicles and new EPA compliant vehicles for fuel efficiency reflect that glider kits are 20% more efficient on fuel consumption. Glider vehicles also reuse engines and other components in the remanufacturing process, resulting in the reuse of approximately 4,000 pounds of cast steel. The engine assembly alone accounts for approximately 3,000 pounds of recycled cast steel. Thus, the well-documented environmental impact of casting steel, including the significant NO_x emissions, is avoided by reusing cast steel components in glider vehicles. Consequently, given the superior fuel efficiency and the reuse of cast steel, glider vehicles have a lower carbon footprint than OEMs. None of these facts were considered in the development of the Phase 2 rule.

From an economic standpoint, Tennessee Tech examined the impact of the Phase 2 Rule sales cap of 300 units for glider kits would have on the State of Tennessee. The 300 unit sales cap represents 9% of Fitzgerald's current sales. It is estimated that a 91% reduction in output by Fitzgerald would result in a direct loss of approximately 947 jobs and a loss of approximately \$512 million of economic output in the State of Tennessee alone. This impact takes into account the direct and indirect economic impact, including expenditures on labor, operations and maintenance as well as changes in the supply chain throughout the state. Additionally, on a broader scale, the economic impact of the Phase 2 Rule could easily exceed \$1 billion nationwide due to thousands of permanent job losses and supply chain interruption and reduction. The Phase 2 Rule failed to sufficiently evaluate and consider these impacts.

Finally, this phase of the research shows that trucking companies that utilize glider kit HDVs in their fleets are vigilant in maintenance and elect to optimize their fleets to maximum efficiency throughout the life span of the vehicle. Further, glider kit assemblers facilitate research and development for OEM's by conducting innovative research for fuel additives, emission devices, tire and wheel combinations in small production runs and are currently testing components, light weight drive systems, alternative fuel mixtures, autonomous drive systems, light weight body materials, and intelligent transportation systems. As a general statement, our observation is glider assemblers are in tune with industry needs and cutting edge innovation.

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Tennessee Tech will continue to evaluate HDV engines during Phase II of the research in 2017. Such effort will be conducted in conjunction with the Oak Ridge National Lab - Fuel Engines & Emissions Research Center. The goals of the next phase include development of engineering and manufacturing solutions that exceed EPA emission standards, a focused research, development, and testing plan for NO_x emissions, and to continue testing to demonstrate continuous improvement of emissions from remanufactured heavy-duty engines.

Sincerely,



Philip B. Oldham
President



Thomas Brewer
Associate Vice President
Center for Intelligent Mobility

APPENDIX A: Testing Results from Tennessee Tech Phase 1 Heavy Duty Vehicle Study

Engine	Type	CO (g/HP * hr) (2010 standard = 15.5)	PM
Detroit Diesel DD15	ReMan	0.290	BTD
Caterpillar CT13	ReMan	0.212	BTD
Detroit Diesel Series 60	ReMan	1.553	BTD
Detroit Diesel Series 60	ReMan	1.959	BTD
Detroit Diesel Series 60	ReMan	0.015	BTD
Detroit Diesel Series 60	ReMan	0.317	BTD
Detroit Diesel Series 60	ReMan	0.483	BTD
Detroit Diesel Series 60	ReMan	0.467	BTD
Detroit Diesel DD15	OEM	0.491	BTD
Detroit Diesel DD15	OEM	1.169	BTD
Detroit Diesel DD15	OEM	0.556	BTD
Detroit Diesel DD15	OEM	0.098	BTD
Detroit Diesel DD15	OEM	1.558	BTD

*BTD=below threshold detection point

** NO_x (g/HP * HP) (2010 standard = 0.2); All tested engines were higher than the standard and ranged from a low of 0.44 to a high of 6.45. The lowest tested NO_x was a Fitzgerald – Reman Detroit Diesel DD 15 using proprietary Fitzgerald engine design and set up. That same engine also tested at the 0.290 Co rate.