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U.S. Environmental Protection Agency (EPA)
EPA Docket Center-OAR (MC-28221T)
1200 Pennsylvania Avenue NW,
Washington, DC 20460

RE: Greenhouse Gas (GHG) Emissions Standards for Heavy-Duty Vehicles-Phase 3; 40 CFR Parts 1036, 1037, 1054, 1065, and 1074; Doc. No. EPA–HQ–OAR–2022–0985.

Ladies and Gentlemen:

The American Truck Dealers division of the National Automobile Dealers Association (ATD) represents over 1,800 franchised commercial motor vehicle (CMV) dealers nationwide who sell new and used medium- and heavy-duty CMVs and who engage in service, repair, and parts sales. Together they employ more than 125,000 people in high paying jobs[1] nationwide with over 87% of CMV dealers defined as small businesses by the Small Business Administration (SBA).

Earlier this year, EPA proposed more stringent standards to reduce GHG emissions from heavy-duty vehicles (HDVs) beginning in model year (MY) 2027.[2] First, EPA is proposing stronger GHG standards for MY 2027 HDVs that go beyond those that currently apply under the Phase 2 GHG program.[3] EPA also is proposing a new set of GHG standards for HDVs that would begin to apply in MY 2028, progressively tightening each MY through 2032 ("Phase 3"). The Phase 3 GHG performance standards do not mandate the use of specific technologies, but EPA expects that the new HDVs covered by Phase 3 to include a mix of internal combustion engines (ICE) and zero-emission vehicle (ZEV) technologies such as battery-electric vehicles (BEVs) or hydrogen fuel-cell electric vehicles (FCEVs).

The following comments and suggestions focus on the potential impacts of EPA's proposal on new HDV sales and fleet turnover.

I. ATD dealers support continuous improvements in environmental and fuel economy performance of the fleet.

Without a doubt, alternative-fueled HDV sales have grown and will continue to grow. And America's car and truck dealers are doing their part to embrace this technological revolution

[1] The average salary of a HDV dealership employee is $78,740 in comparison to the U.S. private sector at $60,575.07. *See* 2021 NADA Workforce Study Data and *National Average Wage Index*, SSA.
[2] 88 Fed. Reg. 25926, *et seq.* (Apr. 27, 2023).
[3] *Final Rule for Phase 2 GHG Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles*, EPA, (Aug. 3, 2022).

and facilitate the introduction of alternative vehicles into the fleet. As evidenced by activities at the 2022 and 2023 NADA/ATD Shows[4], and by its work with the U.S. Departments of Transportation and Energy on the deployment of critical public charging facilities, ATD is committed to supporting alternative-fueled vehicles. To this end, NADA/ATD estimates that franchised dealerships are on track to spend billions in EV infrastructure.[5]

Dealership investments necessary to sell and service ZEV HDVs vary widely with cost estimates costs ranging from $100,000 to over $1 million per store. These estimates do not necessarily include all the specialized equipment purchases needed to service ZEVs or the additional costs from local utilities for extending new power lines or adding transformers. In many cases, installing electric chargers requires a more comprehensive electric system, including new transformers and power lines. Installations of this magnitude can involve major construction, which is accompanied by permits, supply chain delays, and environmental safety requirements, all barriers that HDV dealers are working to overcome.

As the frontline of customer education, HDV dealers are investing in staff training across departments so that prospective ZEV purchasers receive the most accurate, current, and complete information about ZEVs. Some dealers are taking that work to the next step with dedicated ZEV education programs. This includes bringing ZEV HDVs to local auto shows and customer events and even educating first responders on proper battery safety when responding to crashes involving ZEVs.

These investments echo ATD's long-standing support of continuous emission improvements for HDVs. At the same time, ATD has suggested consistently that new emissions mandates must not compromise the affordability, reliability, fuel economy, and/or serviceability of HDVs. This position reflects the fact that prospective customers will avoid purchasing or leasing new HDVs that cost too much, offer performance compromises, or pose risks of unacceptable downtime.

This rulemaking occurs at a time when HDV dealerships and their customers are just beginning to evaluate alternative HDV technology options and to understand the infrastructure that is necessary to support those options.

II. EPA's failure to provide for an adequate rulemaking process necessitates that its Phase 3 GHG program be subject to periodic review.

Today, less than 1% of new HDV sales are ZEVs. Yet, the Phase 3 proposal projects a near transformation of the new HDV sales from ICE to ZEV HDVs. Such a transformation would require massive changes to the design and manufacturer of HDVs and to their refueling infrastructure (e.g., from the nation's electrical grids or a new facility designed to deliver highly-

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[4] *See* Appendix A: "Everything Electric" at NADA/ATD Show 2022-2023.

[5] This projection is based on available data from a selection of vehicle manufacturer brands and dealerships. This number reflects data from franchised dealerships that sell new light-, medium-, and/or heavy-duty vehicles.

compressed or liquified hydrogen). Such a transformation will require thoughtful changes in business and transportation logistics and related human behavior, and even changes in traffic patterns and land use for charging infrastructure and ZEV HDV parking.

Yet despite the obvious need for a thoughtful and deliberative process, EPA has engaged in a compressed Phase 3 GHG rulemaking schedule, breaking from established practices of previous Clean Air Act rulemakings.[6] This has deprived industry stakeholders of the chance to provide crucial information to the agency—including data that would have been pertinent to the agency's decision-making. This break in practice is particularly difficult considering the nascency of the technology and the many challenges and unknowns of the ZEV HDV marketplace.

For example, EPA failed to issue an Advanced Notice of Proposed Rulemaking (ANPRM) and declined requests for a reasonable comment period extension shutting off the ability of key stakeholders to gather relevant data to provide robust and thoughtful review and comment.[7] ATD and ATA had sought a reasonable time period to collect and provide EPA with data to inform its ability to make reasonable forecasts of the market adoption of ZEV HDV technologies, including with respect to such factors as charging and refueling infrastructure, power generation and transmission needs, technology related costs such as raw materials, technology advancements and manufacturing capabilities and operational support requirements. Both associations had undertaken to solicit real world data on these very important topics. Yet EPA imprudently denied the extension request, stating wrongly that the existing truncated comment period "provided sufficient avenues for stakeholders to provide their data, views, and arguments."

Despite the transformational nature of the Phase 3 GHG proposal, EPA appears to have based nearly all its major assumptions and predictions on a "literature review,"[8] in contrast with prior rulemakings that involved data generated and provided by key stakeholders and agency engine tests and simulations. For example, instead of allowing HDV manufacturers to provide well-defined costs related to batteries, technology packages, and charging equipment, the EPA is relying on third-party research. As a result, EPA's payback periods and adoption rates are missing important inputs and are rife with inaccuracies.

A. Recommendations

Consequently, ATD requests that the Phase 3 GHG program provide for a biennial review and evaluation of the market and technological assumptions underlying the GHG emission standards that take effect three years from the review date. This biennial review process will

[6] *See e.g., Advance Notice of Proposed Rule: Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine Standards, EPA, (Feb. 16, 2023)*.
[7] On May 26, 2023, ATD and the American Trucking Association (ATA) requested a 45-day comment period extension; Appendix B: ATA and ATD Extension Request.
[8] The review appears to have included research, surveys, and models developed by International Council on Clean Transportation (ICCT) and Argonne National Laboratory (ANL), including ANL's BEnefit ANalysis ("BEAN") model.

enable EPA to engage with stakeholders, including HDV manufacturers, dealers, fleet and truck owners, and infrastructure providers, to review based on objective and rational criteria aimed at ensuring the effective and efficient rollout of ZEV HDV technologies and infrastructure. As detailed below, EPA's biennial review should in part rely on an updated version of its Heavy-Duty Technology Resource Use Case Scenario (HD TRUCS) tool, with revisions to key analyses and assumptions involving, but not limited to: (1) all cost inputs; (2) payback periods; (3) projected adoption rates; and (4) updated infrastructure monitoring and benchmarks. This process should result in an appropriate revision of Phase 3 standard stringency based on the updated HD TRUCS analysis.

III. Any reopening of the Phase 2 GHG mandates would undermine market stability.

ATD categorically opposes any increases to the stringency of the Phase 2 GHG standards applicable through MY 2027 as they would undermine the regulatory certainty that is critical to compliance and marketplace stability. The Phase 2 standards resulted from a carefully coordinated joint rulemaking with the National Highway Traffic Safety Administration (NHTSA), the agency primarily responsible for administering the Energy Policy and Conservation Act (EPCA), as amended by the Energy Independence and Security Act (EISA).[9] Clean Air Act (CAA) section 202(a)(3)(C) states that four-year lead time and three-year stability periods are required for HDV emission standards and a reopening of Phase 2 for MY 2027 would not comport with this statutory mandate. Thus, it would be contrary to the CAA and the intent of Congress for EPA to revise the Phase 2 GHG standards. Moreover, EPA's suggestion that the Phase 2 GHG mandates should be tightened based on aspirational HDV manufacturer goals for the potential rollout of ZEV HDVs is necessarily arbitrary and capricious.

III. The Phase 3 GHG standards must be affordable and must not compromise performance.

A. Background on HDV sales and marketplace.

HDV customers are vastly different than light-duty customers in that new HDVs are primarily sold to businesses and to government fleets. Those customers range widely from large and sophisticated fleets running many vehicles and vehicle classes to a single owner/operator running one truck. And, unlike for light-duty vehicles, HDVs are highly customizable to meet the needs of customers who often spec engines and other major components from a variety of manufacturers with no single one having complete dominion over the finished product. For prospective HDV buyers, choosing the right HDV is crucial to maximizing operational efficiency and to ensuring business profitability. Thus, all new HDVs potentially covered by the Phase 3 GHG proposal have a work purpose that must be met through unique design, specification, ordering, and manufacture processes. Every customer's needs are different.

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[9] Section 102 of EISA specifically mandated that NHTSA coordinate with EPA to establish fuel economy/GHG standards for medium- and heavy-duty trucks. 49 U.S.C. §32902(b)(1)(C).

In years of high HDV sales, only a few hundred thousand new units are built for sale nationwide. This number pales in comparison to the 10-17 million new light-duty vehicles sold nationwide each year. Moreover, unlike for most new light-duty purchases, prospective new HDV buyers are businesspersons who carefully consider both the upfront cost of vehicle features, the costs of operation (e.g., fuel efficiency, range, payload), and vehicle resale values, especially when credit is tight and/or freight rates and profit margins are low. Fuel is the number one variable cost for the trucking industry. In fact, most new HDV customers focus on fuel efficiency once they have determined which vehicle and drivetrain features are essential to meet their specific business needs. Consequently, the final rule must leverage, not resist, the fact that acceptable total cost analysis (TOC) and return on investment (ROI) is critical to new HDV purchasers.

B. Real life emission reductions require that EPA set standards designed to maximize, and not undermine, fleet turnover.

The Phase 3 GHG proposal appears to require, at least indirectly, that HDV manufacturers design, build, and sell more ZEV HDVs, and as such departs significantly from previous rules as the success of doing so will depend on 1) the build out and scaling of a national infrastructure system to enable operation of such HDVs and 2) customer purchase incentives sufficient enough to drive a demand for ZEV HDVs which currently cost three-five times more than their ICE-counterparts. Appropriately structured HDV standards must involve a national, wholistic approach to reducing GHGs. Specifically, *EPA must only adopt new HDV emission standards that will enhance (and not inhibit) fleet turnover.* If EPA instead moves too far, too fast, necessary infrastructure will not be available and the cost of new HDVs will increase dramatically, resulting in a decline in the otherwise applicable rate of fleet turnover and GHG reductions. Prospective HDV customers almost always have the option to keep existing vehicles on the road longer, opting for enhanced maintenance and repair strategies that may even include engine and/or vehicle re-building. Alternatively, HDV customers may meet their needs with used vehicles, often at costs significantly lower than that of new federally compliant HDVs.

The trucking industry learned this firsthand with HDEs subject to EPA's 2002-10 NOx standards. A study conducted in-house by ATD details the dramatic impact those standards had because they proved costly to comply with and they led to degraded vehicle performance.[10] The study found that EPA underestimated control strategy and technology compliance costs by a *factor of 2-5,* resulting in dramatically higher prices for new HDVs. It also found that EPA's mandates resulted in significantly higher operating costs, due to increased maintenance requirements, reduced reliability, and lower fuel economy. Together, the higher HDV prices and operating costs that directly stemmed from EPA's 2002-10 HDE NOx standards resulted in a significant disruption of the new HDV marketplace, leading to lost employment, lost profits, and even the

[10] *See* Appendix C: A Look Back at EPA's Cost and Other Impact Projections for My 2004-2010 Heavy-Duty Truck Emissions Standards. *See also* Jack Roberts, Is the Largest Truck Prebuy Ever on the Horizon?, Fleet Management, (Sept. 1, 2022).

shuttering of some businesses. New HDV customers acted rationally and predictably to avoid higher prices and performance compromises. Many opted to pre-buy new HDVs. Others opted to hold onto their existing equipment for longer than they otherwise had planned to. Still others met their business needs by seeking out late model used HDVs. Employees suffered, the industry suffered, and the environment suffered as fleet turnover ground to a halt.
This history must not be repeated. EPA must ensure that the Phase 3 GHG mandates will be supported by adequate infrastructure, will be technologically feasible, and will be cost effective, both up front and over the useful life of the HDVs they will apply to. The following discussion details how EPA must better consider cost and infrastructure to leverage fleet turnover.

C. EPA's assessment of upfront HDV costs and payback is incomplete and inaccurate.

After accounting for the IRC Section 45W HDV tax credits provided for in the Inflation Reduction Act (IRA), EPA estimates that the typical buyer of a new HDV ZEV would:

- Pay an average of between $900 and $11,000 more in upfront costs for a MY 2032 vocational ZEV HDV than for a comparable ICE HDV but would recoup those costs in 3 years or less through yearly operational savings.
- Pay an average of $17,000 more in upfront costs for a MY 2032 day-cab tractor ZEV HDV than for a comparable ICE HDV and would recoup these costs in 3 years or less though yearly operational savings.
- Pay an average of $15,000 more in upfront costs for a MY 2032 sleeper cab tractor ZEV HDV than for a comparable ICE HDV but would recoup these costs in 7 years or less though yearly operational savings.

These estimates were built using HD TRUCS. To develop HD TRUCS, EPA relied on literature to determine the cost of components and technology packages, and then applied TCO calculations and other data assumptions. EPA then used HD TRUCS to perform payback period calculations to determine the number of years it will take for the TCO of a ZEV HDV to be equal to that of a comparable ICE HDV. While HD TRUCS is a strong tool for the assessment of ZEV technologies in the marketplace, ATD submits that there are several aspects of HD TRUCS and the underlying data or assumptions that are incomplete and inaccurate. EPA must rectify these issues finalizing its Phase 3 GHG mandates to ensure that forecasted payback periods and adoption rates reflect reality.

ATD defers to the comments submitted by the Truck and Engine Manufacturers Association (EMA) and its members regarding HDV and technology package pricing and feasible timelines. Today, new ZEV HDV sales prices are approximately 3-5 times that of comparable ICE HDV prices, before any tax incentives or grants. Industry studies that align with this observation report that the cost of a 450-kWh ZEV HDV battery would be between $144,000 and $243,000 before taxes and fees, which pushes the base price of a Class 8 BEV tractor to $350,000 to

$500,000 or three to five times the price of a new diesel HDV.[11] While it is projected that battery prices may come down over time, it makes no sense to suggest that the prices of new ZEV HDVs will average a mere 10-20% above the price of new ICE HDVs in 2032.

As noted below, EPA's use of HD TRUCS also fails to address certain purchaser costs such as federal excise taxes (FET), state sales taxes, resale values, and charging-related downtime.

1. State sales and FET taxes

In assessing payback periods, EPA has neglected to account for FET and state sales taxes. These taxes are additional costs levied on new HDV purchases. Because they are based on a percentage of an HDV's sales price, they are necessarily higher for ZEV HDVs due to their higher upfront costs. The chart below provides a real-world price comparison illustrating how FET and sales taxes compare across ZEV HDVs and comparable ICE HDVs. In this example, an average 5% state vehicle sales tax[12] was used with Class 8 HDVs subject to an additional 12 percent FET.

	Day Cab	Day Cab EV	Garbage Truck	Garbage Truck EV	Box Truck	Box Truck EV
List Price	$ 166,346	$ 496,526	$ 188,306	$ 535,390	$ 81,797	$ 321,803
FET (12%)	$ 19,962	$ 59,583	$ 22,597	$ 64,247	$ 9,816	$ 38,616
AVG. State Vehicle Sales Tax (5%)	$ 8,317	$ 24,826	$ 9,415	$ 26,769	$ 4,090	$ 16,090
Total Cost	**$ 194,625**	**$ 580,936**	**$ 220,318**	**$ 626,406**	**$ 95,703**	**$ 376,510**
Capacity Range (in Miles)	1,400	150	500	80	600	150
Weight of Unit (lbs.)	16,900	23,697	18,106	26,126	10,023	15,471
Payload Capacity (lbs)	52,100	45,303	47,894 *	39,874 *	22,977	15,529
			* Based on specified bare chassis weight and axle ratings not Fedral or local Bridge Laws.		Classification of truck determines if FET is applicable	

Throughout its regulatory impact analysis, EPA relies heavily on provisions arising from the IRA and the Infrastructure Investment and Jobs Act (IIJA) to promote ZEV HDV market growth. ATD believes that, in reality, these ambitious pieces of legislation will have limited impact on the adoption of ZEV HDVs. For example, the maximum $40,000 IRC Section 45W Clean Commercial Vehicle Tax credit is likely to be more than offset by the FET on a Class 8 ZEV tractor. Moreover, EPA incorrectly assumes that manufacturers will pass on *all* of the BEV manufacturing tax credits they receive in the form of lower ZEV HDV pricing.

2. Resale values

Resale value and vehicle depreciation is a key factor in determining HDV TCOs and first purchaser behaviors. ATD submits that the Phase 3 proposal fails to consider the impact of

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[11] *Sustainable Fleets 2023: The Road from Diesel to ZEVs*, HEAVY DUTY TRUCKING, (May 22, 2023); See also, Claire Buysse, How Much Does An Electric Semi Really Cost?, ICCT (Feb. 24, 2022).
[12] Rachael Brennan, Auto tax rate by state, POLICYGENIUS (Jan. 20, 2023).

resale values. Resale values are based on the work a vehicle is capable performing and the expected maintenance and repair costs for a given period. Currently, there is no established resale history for ZEV HDVs. As a result, most dealerships and new HDV customers are conservatively factoring in the resale value as zero for purposes of their TOC calculations. HDV tractors typically have a 3-5 year trade cycle and HDV trucks range from 7-10 for most operations. Any reduction in resale value ultimately negatively impacts the TCO for first owners and increases payback periods. Consequently, first owners/adopters will be cautious when considering the purchase of ZEV HDVs.

3. Charging rates and charging downtime

A common phrase is the commercial truck space is – "Trucks that don't move don't make money." EPA ignores this reality when it points to savings from lower fuel, DEF, and maintenance costs but fails to account for the costs associated with the necessary downtime for ZEV HDV charging. It appears that EPA assumes all ZEV HDVs will return to a centralized location to recharge for 12 hours overnight. This is unrealistic. For example, many HDVs drive exclusively at night to avoid traffic or operate with multiple duty cycles each day. These HDVs will incur significant charging and downtime costs, especially if Level 2 chargers are used.[13]

4. Recommendations

ATD recommends that EPA act as follows:

- Work with EMA and its members to determine the appropriate assumptions, data, and calculations that should be included in HD TRUCS related to the price, feasibility, and timelines of technology packages and related components.
- Factor in FET and sales taxes, resale values, and charging-related downtime to more accurately determine HDV ZEV purchaser costs and related payback periods.
- Work with HDV fleet and owner/operators to ensure the accuracy of purchaser costs.

The above recommendations serve as a starting point. EPA must revise HD TRUCS to include additional and more accurate data points using feedback from stakeholders. These revisions must be reflected in the final Phase 3 GHG rule to help accurately forecast realistic payback periods and adoption rates.

D. EPA's proposed rule fails to appropriately consider infrastructure lead times and costs.

EPA has failed to analyze or model the essential and unique refueling infrastructure needs and costs associated with its Phase 3 GHG proposal. ZEV HDVs will have special refueling

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[13] According to the U.S. DOT the estimated BEV charge time from empty on a Level 2 charger is 4 – 10 hours and the estimated range added per hour of charging is 10 – 20 miles. *Charger Types and Speeds*, U.S. DOT (May 4, 2023).

infrastructure needs versus light-duty ZEVs. Without sufficient infrastructure, the number of ZEV HDVs purchased between 2028 and 2032 will be far lower than EPA forecasts. One of several impediments to widespread charging infrastructure availability is the cost.[14] Among other things, the costs associated with EV charging infrastructure include the equipment itself, ongoing operation and maintenance costs, and the back-end equipment, transmission, and installation costs needed to get power to the charging station site. These should be considered as purchaser costs in the HD TRUCS tool as those costs are passed on to HDV purchasers installing infrastructure. In addition to private infrastructure, a massive amount of costly public refueling infrastructure designed for ZEV HDVs must be built out. This will take time.[15]

1. HDV dealer and purchaser infrastructure costs and lead times.

As mentioned, dealerships are investing billions in the infrastructure and equipment to sell and service ZEV HDVs. Customers will also require infrastructure at their facilities and an existing and reliable public refueling infrastructure to support the effective use of ZEV HDVs. A typical CMV dealership would require the following facility and infrastructure upgrades to sell and service ZEV HDVs.:

- Two EV chargers (Level 2 or DCFC) to ensure availability for sales and service;
- Service lifts with higher weight capacity;
- Service bays that can accommodate additional lift heights of approximately six feet to facilitate high-voltage battery maintenance and removal;
- Battery storage and quarantine containers[16]; and
- Workplace safety and emergency response training to navigate the potential dangers associated with vehicle high-voltage systems and components.

The costs involved in these investments can easily exceed $1,000,000 per dealership. Ultimately, the ability and timeline to make facility upgrades and install chargers will vary significantly by dealership location, the utility upgrades necessary, and permitting lead times. In an initial survey of ATD members, dealership charger installation timelines ranged from less

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[14] M. Melaina et al., *Consumer Convenience and the Availability of Retail Stations as a Market Barrier for Alternative Fuel Vehicles*, NREL (Jan. 2013).

[15] *Hydrogen Fueling Station Locations*, DOE.

[16] EV battery temperature must remain at approximately 70 to 75 degrees, depending on the manufacturer. When a vehicle comes in for repair, a battery may be removed or disconnected from the low-voltage system (12-volt) which maintains the battery temperature. For example, for any body work that requires painting, a battery may need to be removed due to high temperatures achieved within a paint booth, especially during the curing of the paint. Any removed battery requires special storage. The optimal scenario would be a storage/building outside facility that is temperature-controlled and has a ventilation system. Current National Highway Transportation Safety Administration guidelines suggest 50 feet of separation between a stored battery and a building or another vehicle. Ventilation is very important for EV batteries; there must be ventilation around the battery, including underneath it. When a high-voltage battery is damaged, it can leak fluoride gas, which is heavier than air, causing it to sink and not rise. This gas is highly flammable, and this situation can be created by a chemical reaction in the battery cells before a thermal runaway (or high-voltage battery fire) occurs.

than one year to greater than three years. Some locations will need minimal to no utility upgrades for charger installation, but in most cases, electrical infrastructure (e.g., trenches, distribution transformers, switchboards, and conduit) will need to be upgraded or installed to accept the high-power service necessary to support several chargers. EPA correctly notes power needs as low as 200 kW could trigger a requirement to install a distribution transformer.[17] However, EPA fails to acknowledge that the electric sector is facing significant supply chain issues for distribution transformers with the average lead time for transformer delivery at 12-18 months (which is expected to increase).[18] Dealerships requiring distribution transformer upgrades have stated that it has increased their charger installation lead times to between three and five years. In effect, they will be unable to begin selling and servicing ZEV HDVs until these upgrades are completed. Further, dealerships that rent or lease their buildings or property are generally unable to even install chargers due to landlord restrictions on property and building modifications.

ZEV HDV fleets and owner/operators will also require facility and infrastructure upgrades. Their needs will vary, but in many cases will meet or exceed those of HDV dealerships. This is particularly true for fleets that perform their own service work or engage in depot charging during off hours. For example, a local transit agency with 15 ZEV school buses may need several ZEV-ready service bays, parking lot upgrades, and several chargers for fleet charging.

It's worth noting that dealership investments are being made now *in preparation* for an expected future marketplace. But customers are asking whether ZEV HDVs will be affordable and will meet their needs and expectations. Only when ZEV HDVs and related refueling infrastructure costs "pencil out" will customers begin to adopt them. EPA must strive to accurately assess the costs and timing of necessary ZEV HDV refueling infrastructure.

2. EPA's infrastructure assumptions must be adjusted to reflect reality.

The infrastructure needed to support ZEV HDVs will require increased electricity generation capacity and a more comprehensive transmission system than exists today. EPA has not considered necessary public charging investments. Apparently, the Phase 3 GHG proposal envisions that all the battery-recharging stations for ZEV HDVs will be located at trucking depots and terminals where trucks park overnight. But depot charging will result in high electricity demands and significant upgrades to transmission lines and substations to support each depot. On-site power availability limits the number of ZEV HDVs a site can charge. The assumption that ZEV HDVs will exclusively charge at night is a fallacy as many will need to be charged on route at

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[17] 88 Fed. Reg. at 25,983.

[18] Robert Walton, Utilities sound alarm over distribution transformer shortage as procurement times surpass 1 year and costs triple, Utility Drive (Dec. 19, 2022). Further, the electric sector anticipating a final rule from the Department of Energy which would increase the distribution transformer efficiency standards, and shift production to an entirely different type of steel, for distribution transformers further exacerbating this issue. *See also* Paul Ciampoli, Proposed efficiency standards for distribution transformers would worsen shortages, POWER GRID INTERNATIONAL (March 31, 2023).

public battery-recharging stations, in addition to at depots. Sites acting as electrified truck stops will also concentrate electricity demands and could require the same amount of energy as a small town.[19] EPA's final Phase 3 GHG rule must reflect realistic infrastructure timelines and demand considerations.

3. Projections suggest that there will not be enough public charging infrastructure available to support EPA forecasted adoption rates.

Several studies have assessed the scale of the refueling infrastructure that will be needed to meet projected ZEV adoption rates. A 2022 utility industry estimate on the charging infrastructure needed to support the projected 2030 EV marketplace points to an alarming and growing infrastructure gap. According to the report from the Edison Electric Institute (EEI), more than 2.6 million charge ports in workplaces and public locations will be needed by 2030.[20] EEI states: "The significant difference between the current availability of charging infrastructure and the expected charging infrastructure needed suggests a growing "infrastructure gap" that must be addressed."[21] EEI goes on to state that "the number of DCFC ports needed in 2030 to meet demand is more than double the planned DCFC ports."[22] The DCFC planned investments include those investments planned by state and federal governments under relevant incentive programs, automakers, electric companies, and the National Electric Highway Coalition.

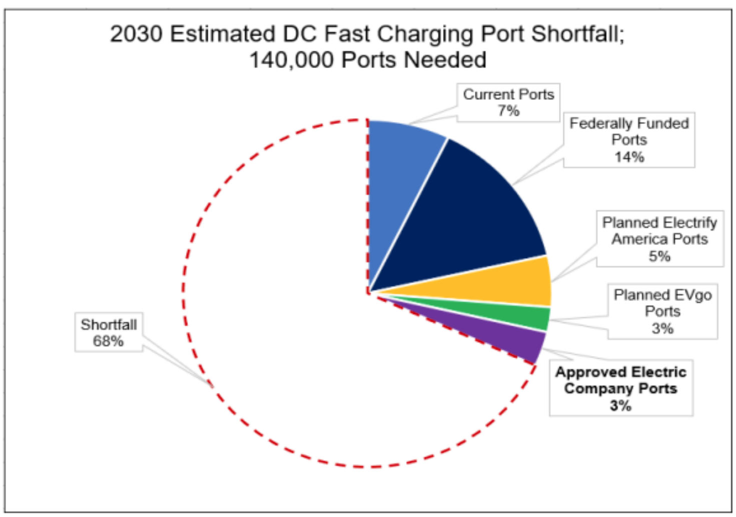

Figure 1: Planned Ports and EEI Projection of DC Fast Charging Port Shortfall by 2030 based on 32% Light-Duty BEV Penetration (June, 2022)

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[19] *High-Voltage Transmission Grid Critical to Meeting Electric Vehicle Charging Demands, First-in-the-Nation Study Finds*, NATIONAL GRID (Nov. 14, 2022).

[20] Charles Satterfield et al., *Electric Vehicle Sales and the Charging Infrastructure Required Through 2030*, EDISON ELECTRIC INSTITUTE (June 2022).

[21] *Id.* at 12.

[22] *Id.* at 15.

Even more alarming is that EEI's conclusions are based solely on an estimated 32 percent of total light-duty vehicle sales in 2030.[23] Since then, the EPA has issued sweeping regulatory proposals that together estimate that by MY 2032 new vehicle sales will include:

- Nearly 70 percent ZEV penetration across the light-duty sector;
- Nearly 40 percent ZEV penetration across the combined medium-duty van and pickup truck categories;
- Some 50 percent ZEV penetration for vocational vehicles;
- Some 34 percent ZEV penetration for day cab tractors; and
- Some 25 percent ZEVs for sleeper cab tractors.

On May 11, 2023, the ICCT released a report entitled, "Near-Term Infrastructure Deployment to Support Zero-Emission Medium- and Heavy-Duty Vehicles in the United States" (ICCT Report). This report directly addresses commercial infrastructure predictions and confirms industry infrastructure concerns. The ICCT Report states that by 2030, 522,000 overnight chargers, 20,500 fast chargers, and 9,540 ultrafast chargers will be needed to support the estimated 1.1 million ZEV trucks.[24] These numbers are over and above those necessary for light duty ZEVs. Further, the ICCT Report states that the "most recent TCO analysis for the United States shows no case of positive TCO for hydrogen trucks relative to battery-electric trucks."[25]

New investments in charging infrastructure are being announced daily[26] and ATD is hopeful EPA's GHG proposals and other government incentive programs will provide investors with the reassurance they need to build necessary infrastructure. Reliable refueling infrastructure is critical to the successful adoption of ZEV HDVs and must be accounted for by EPA.

4. Recommendations

Dealerships are doing their part to sell and service commercial ZEVs. However, without adequate assurances that the appropriate infrastructure will be in place in time, customers will simply not purchase ZEV HDVs. Infrastructure represents the most complex, expensive, and

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[23] Government and private support of EV charging has traditionally been focused on light-duty charging as light-duty EVs were introduced to the market first. Medium- and heavy-duty EV charging woes are compounded by the fact that most publicly available EV chargers are not physically accessible to larger vehicles. Chargers are often located in parking lots designed only to accommodate light-duty EVs excluding most medium- and heavy-duty buses and trucks from accessing the growing network of public chargers.

[24] Pierre-Louis Ragon et al., *Near-Term Infrastructure Deployment to Support Zero-Emission Medium- And Heavy-Duty Vehicles in The United States*, ICCT (May 2023).

[25] *Id.* at 3.

[26] *See e.g.*, Michelle Lewis, *Daimler just announced a $650M US-wide EV charging network for trucks*, ELECTREK (April 27, 2023) and Vishal Kapadia, Leading the Charge: Walmart Announces Plan To Expand Electric Vehicle Charging Network, Walmart (April 6, 2023).

longest lead time challenge to transition our industry. For a Phase 3 GHG rule to be successful, an "all-in" approach by the government is required. Consequently, ATD recommends the following:

- That EPA work with purchaser stakeholders to ensure that that purchaser costs and lead time associated with EVSE equipment and charging are accurate.
- That EPA work with other agencies to establish clear data and related benchmarks for assessing the deployment of essential ZEV HDV refueling infrastructure.
- That EPA ensure that forecasted adoption rates are supported by available infrastructure. EPA must monitor necessary infrastructure investments and modifications to the Phase 3 rule should be made if they fall short.

E. Significant technician training investments are necessary to support the ZEV HDVs.

As the number of ZEVs on the road increases, there will be increased demands on the technician workforce required to maintain the vehicles. This demand in ZEV training of technicians is also occurring during a nationwide technician shortage.[27] When an ZEV needs service or repair, not every technician can perform the work. Once dealerships begin making the investment in their facility to support the sale and service of ZEVs, their next investment is in technician ZEV training.

Technicians require training to work on ZEVs safely and properly. The hydrogen cell and battery-electric vehicles operate with very high voltage. Therefore, technicians need to know how to safely shut down and disconnect these systems prior to working on the vehicle. Not all technicians need to be trained on high voltage usage, but all technicians must have at least a basic understanding of EV safety, precautions, and emergency response procedures. For technicians that will be working on the mechanical and low-voltage systems of the vehicle, a short electrical safety familiarization course is all that is necessary. For technicians that intend to specialize in high voltage vehicles, while the training requirements vary by manufacturer, certification ranges from 2-4 weeks and requires courses in high voltage electrical and battery safety, along with technical service and maintenance courses for high voltage vehicles.

With battery electric vehicles having large amounts of electrical energy stored onboard, there are several precautions that need to be taken to prevent exposing service technicians to severe electrical shock. Motors, inverters, HVAC systems and the air compressor all are driven by high voltage AC current and require specific training to safely service. Training on the use of proper personal protective equipment and the inspection for reuse is critical. It is also recommended that there be a trained observer outside of the electric vehicle work area to assist in the case of an emergency.

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[27] *See e.g.,* Ed. Garsten, *Repair Tech Shortage Costing Motorists Time And Money, CCC Study Shows*, FORBES (March 15, 2022). Trey Howard, *New technology contributing to nationwide auto technician shortage*, WDAM (Feb. 24, 2023).

The U.S. is projected to see a shortage of 642,000 technicians by 2024.[28] ATD is concerned this industry shortage will be exasperated when combined with the increased education requirements needed to service ZEVs. This expertise shortage could undermine projections that ZEVs will save owners money on maintenance, at least until enough the skills gap is addressed.

IV. Conclusion

Reducing emissions requires more than just setting new standards. EPA must recognize the importance of turning over America's HDV fleet to achieve environmental benefits. Like Phase 1 and Phase 2, EPA's Proposed Phase 3 GHG standards will govern how new trucks are built for sale, not whether and when they are put into use. Dealerships are making the investments necessary to support a successful and accelerated deployment of ZEV HDVs nationwide. It is critical that the Phase 3 GHG mandates be cost effective, be appropriately supported by the infrastructure they require, and be technologically feasible. Otherwise, truck dealerships, their employees, and the economy will suffer, without commensurate environmental or national security benefits.

On behalf of ATD, I thank EPA for the opportunity to comment on this matter.

Respectfully,

/s/

Kaye Lynch-Sparks
Associate Director, Legal and Regulatory Affairs
National Automobile Dealers Association

[28] TechForce Releases 2020 Technician Supply & Demand Report, TECHFORCE (Aug. 31, 2020).

Appendix A: “Everything Electric” at NADA/ATD Show 2022-2023

Everything Electric at NADA/ATD Show 2022

› EV SOLUTIONS CENTER, BOOTH 6557N

Meet with electric vehicle experts one-on-one to learn how to get your operations EV-ready—and attend one of the many info-packed presentations.

Bradley Farr
OEM/Dealership Specialist, Ctr. for Sustainable Energy (CSE)
bradley.farr@energycenter.org

Zach Henkin
Dir., EV/EVI Prog. Research, CSE
zachary.henkin@energycenter.org

Loren McDonald
CEO, EV Adoption
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Frank Morris
Exec. Dir., Clean Cities Georgia
frank@cleancitiesgeorgia.org

Chris Neff
EV Dealer Relations, Plug in America
cneff@pluginamerica.org

Chuck Ray
U.S. Business Development, EV Energy
chuck.ray@ev.energy

Renee Stephens
VP, North America, We Predict
rstephens@wepredict.co.uk

Logan Sullivan
Gaudin Porsche of Las Vegas
lsullivan@gaudinporschelv.com

Matt Teske
CEO, Chargeway
matt@chargeway.net

Nigel Zeid
EV Educator, EV Transformotion
nigel@evtransformotion.com

› PRESENTATIONS AT THE EV SOLUTIONS CENTER, BOOTH 6557N

Friday, March 11

10:00am	**Consumer Trends and Insights for Plug-in Vehicle Adoption** Zach Henkin, CSE
Noon	**True Cost of EV Service in the Field** Renee Stephens, We Predict
2:00pm	**EVs by the Numbers: Past, Present and Future** Loren McDonald; EV Adoption

Saturday, March 12

10:00am	**The EV Market and EV Consumers** Chris Neff, PIA
Noon	**The EV Customer Journey** Chuck Ray, EV Energy
2:00pm	**Dealership Electrification** Dan Young, Future Energy

Sunday, March 13

10:00am	**The EVolution of the Car Salesperson** Nigel Zeid, EV Transformotion

› ELECTRIC AVENUE, SKYBRIDGE BETWEEN NORTH AND WEST LVCC

Stroll down for a look at the history and future of EVs and to learn about dealership EV success stories.

› EV EDUCATION NADA SHOW PRESENTATIONS

Thursday, March 10

12:15pm W325	SUPER SESSION **Plugging into What's Possible: Inside the EV Opportunity for Dealers**

WORKSHOPS

Thursday, March 10

1:00pm W230	**Win in the EV Market** Stephanie Valdez Streaty, Cox Automotive
1:00pm W224	**Marketing to an EV-Focused Future** Brittany Meyer and Connor Bonam, Dealer Inspire
4:00pm W218	**EV Charging Simplified: How to Compete with Tesla** Matt Teske, Chargeway

Friday, March 11

10:30am W228	**Strategic Revenues with Solar and EV Charging** Ryan Ferrero, SunPower

Saturday, March 12

9:00am W221	**Dealership of Tomorrow 2022: Is the Future Electric?** Glenn Mercer
10:30am W218	**Introducing the Next Generation of EV Buyers** Dania Rich-Spencer and Mike Dovorany, Escalent
10:30am W229	**EV Charging Simplified: How to Compete with Tesla** Matt Teske, Chargeway
10:30am W230	**Strategic Revenues with Solar and EV Charging** Ryan Ferrero, SunPower

Sunday, March 13

10:30am W221	**Introducing the Next Generation of EV Buyers** Dania Rich-Spencer and Mike Dovorany, Escalent

THE EXCHANGE

Session: Preparing for the Future of Electric Vehicles

Brainstorm and problem-solve with NADA experts during peer-to-peer table discussions exclusively for and among dealers and managers.

Thursday, March 10, 4:00pm, N258

Friday, March 11, 4:30pm, N262

Sunday, March 13, 10:30am, N260

› ATD COMMERCIAL TRUCK EV EDUCATION

Thursday, March 10, 2:45pm

THE EXCHANGE **Preparing for the Future of Electric Vehicles**
Chopin 2, Encore Las Vegas

Friday, March 11, 8:00am

WORKSHOP **Embrace the Commercial Electric Vehicle Market**
Debussy 2, Encore Las Vegas

Friday, March 11, 10:30am

CONNECTION HUB **Electrification & America's Truck Fleet: A Conversation with Korey Neal**
Encore Ballroom 1-3, Encore Las Vegas

EVERYTHING ELECTRIC
AT NADA SHOW 2023

Electric Avenue Display Highlights Women in EV
LOBBY A, LEVEL 2
NADA salutes women—from multiple OEM brands—who are driving the EV revolution of the auto industry.

EV Solutions Center
BOOTH #7031

Meet with electric vehicle experts one-on-one to learn how to get your operations EV-ready, and attend one of the many info-packed presentations.

Bradley Farr
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Center for Sustainable Energy (CSE)
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Zach Henkin
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Matt Teske
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Nigel Zeid
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Stephanie Valdez Streaty
Research and Development Director,
Cox Automotive Mobilty
stephanie.valdezstreaty@coxautoinc.com

John Thomas
COO, Autel Energy North America
jthomas@autel.com

Presentations at the EV Solutions Center
FRIDAY, JANUARY 27

10am — **Electric Utility Supply Disruption**
Dan Young, President, Future Energy

11:30am — **Roadmap to EV Readiness**
Stephanie Valdez Streaty,
Director of Research & Development,
Cox Automotive Mobility

1pm — **Selling EVs is easy, even in Texas!**
Buzz Smith, Founder, The EV-Angelist

2:30pm — **Ready to transition from ICE to EV?**
Nigel Zeid, EV Educator, EV Transformotion

SATURDAY, JANUARY 28

10am — **Understanding the Disconnect Between Incentive Programs and the EV Customer**
Vaasha Lutchman, Director of Dealerships & Fleets Center of Sustainable Energy

11:30am — **Planning for Equitable Access of EV Charging**
Zach Henkin, Director EV Program Research, Center of Sustainable Energy

1pm — **Charge up Your Dealership Operation to Get Ready for the Transition to EVs**
John Thomas, Chief Operating Officer, Autel Energy North America

2:30pm — **The Future of Fueling: How EV Charging Changes Vehicle Ownership**
Matt Teske, CEO, Chargeway

SUNDAY, JANUARY 29

11:30am — **Plugging Into the New EV Tax Credits**
Andy Koblenz, Executive Vice President, Legal & Regulatory Affairs and General Counsel, NADA

EV Education at NADA Show
WORKSHOPS

Getting Into the Business of Electricity
Thursday, January 26
2:30-3:30pm • D167
Saturday, January 28
9-10am • C145

Key Insights Into EV Markets and Buyers
Thursday, January 26
4-5pm • D161

How EVs Will Change Fixed Operations
Friday, January 27
10:30-11:30am • D174
Saturday, January 28
10:30-11:30am • C146

Plugging Into the New Federal EV Tax Credits
Saturday, January 28
9-10am • D173
10:30-11:30am • C155

EVolve: The Transformation to ElectriFIcation
Sunday, January 29
10:30-11:30am • C147

THE EXCHANGE

Preparing for the Future of Electric Vehicles
Thursday, January 26
4-5pm • D226
Friday, January 27
4:30-5:30pm • D226
Sunday, January 29
10:30-11:30am • D224

2023 NADASHOW

Appendix B: ATA and ATD Extension Request

May 26, 2023

Joseph Goffman
Principal Deputy Assistant Administrator
Office of Air and Radiation 6101A
United States Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460

via email and regulations.gov

Re: Request for extension of comment period on EPA's proposed Rulemaking: "Greenhouse Gas (GHG) Emissions Standards for Heavy-Duty Vehicles-Phase 3" (EPA-HQ-OAR-2022-0985)

Deputy Administrator Goffman,

The American Trucking Associations (ATA) is a 90-year-old federation and the largest national trade organization representing the 7.65 million men and women working in trucking related jobs. ATA is a fifty-state federation that encompasses 34,000 motor carriers and their suppliers, working in all sectors of the industry, from less-than-truckload to truckload, refrigerated transport for food and beverage and life sciences, intermodal trucking, auto haulage, and household goods movement. The American Truck Dealers (ATD), a division of the National Automobile Dealers Association, represents more than 1,800 franchised commercial motor vehicle dealers who sell new and used trucks, tractors and trailers and engage in service, repair, and parts sales. The majority are small businesses as defined by the Small Business Administration yet together they employ more than 125,000 Americans nationwide.

The truck industry has for decades been investing in and adopting new technologies to deliver continuous environmental performance and enhanced fuel economy. In fact, a truck in operation today emits the equivalent emissions of 66 trucks in operation in 1988. Our industry remains committed to adopting enhanced technologies for new vehicles so long as they can feasibly, cost effectively and rigorously meet the requirements of a wide variety of duty cycles. EPA's proposed GHG Phase 3 rules would, by the agency's own admission, require manufactures to produce and introduce into commerce vehicles that meet ambitious new performance standards that likely will necessitate the widespread adoption of zero emission vehicle (ZEV) technologies by our very diverse industry.

ATA and ATD are aggressively working on extensive comments responding to the GHG Phase 3 proposal. Our aim is to provide EPA with information critical to helping ensure that a final rule will foster continuous environmental improvements without unduly impacting new vehicle sales, jobs, trucking operations and the nation's supply chain.

For example, we are in the process of collecting data to inform forecasts of the market adoption of ZEV technologies including with respect to such factors as charging and refueling infrastructure, power generation and transmission needs, technology related costs such as raw materials, technology advancements and manufacturing capabilities and operational support requirements. Notwithstanding EPA's compressed rulemaking schedule for the Phase 3 GHG proposal, both associations have undertaken to solicit real world data on these very important topics. We note that EPA did not issue an Advanced Notice of Proposed Rulemaking and thus did not provide an opportunity to collect and provide data pre-proposal. Consequently, in order to solicit, analyze, interpret and present to EPA the essential data we are seeking, ATA and ATD are requesting a modest 45-day extension of the comment period.

We thank you in advance for your consideration of this matter and we await your expeditious response.

Respectfully,

Jacqueline W. Gelb
Vice President
Energy and Environment Affairs
American Trucking Associations

Doug Greenhaus
Vice President, Regulatory Affairs
Environment, Health and Safety
American Truck Dealers Association

C: Alejandra Nunes, Deputy Assistant Administrator for Mobile Sources
Sarah Dunham, Director, Office of Transportation and Air Quality (OTAQ)
William Charmley, Director, Assessments and Standards Division, OTAQ

Appendix C: A Look Back at EPA's Cost and Other Impact Projections for My 2004-2010 Heavy-Duty Truck Emissions Standards

A LOOK BACK AT EPA'S COST AND OTHER IMPACT PROJECTIONS FOR MY 2004-2010 HEAVY-DUTY TRUCK EMISSIONS STANDARDS

Calpin and Plaza-Jennings

2/13/2012

A LOOK BACK AT EPA'S COST AND OTHER IMPACT PROJECTIONS FOR MY 2004-2010 HEAVY-DUTY TRUCK EMISSIONS STANDARDS

Patrick Calpin, Esteban Plaza-Jennings
American Truck Dealers
February 2012

ABSTRACT:

In 1997, 2000, and 2001, the U.S. Environmental Protection Agency (EPA) published rules establishing a series of new emissions mandates for heavy-duty trucks to be phased-in between model years (MY) 2004 and 2010.[1] Typical of EPA's motor vehicle standards, these "technology forcing" mandates analyzed the development and implementation of new emission control strategies and technologies.

The adoption of these new control strategies and technologies directly resulted in higher prices for new heavy-duty trucks. These mandates also resulted in significantly higher operating costs, attributable largely to increased maintenance requirements, reduced reliability, and lower fuel economy. Together, these higher prices and operating costs led to significant disruptions in the new truck marketplace. These included significant layoffs caused by unprecedented truck pre-buys and sales "cliffs," capital constraints for truck and engine manufacturers (OEMs), suppliers, and dealers; and the departure of certain businesses from the heavy-duty truck market.

This paper examines the degree to which, and possible reasons why, EPA's estimated regulatory impact dramatically underestimated real world costs of the regulation. An analysis of actual sales data, including cost escalators associated with the MY 2004-10 standards, shows that EPA underestimated compliance costs by a ***factor of 2-5***. These higher-than-projected costs resulted in, among other things, significantly lower-than-projected new truck sales which necessarily reduced the environmental benefits associated with these standards. While it is an important issue, this paper does not attempt to quantify the degree to which EPA's projected environmental benefits were not realized.

I. THE 2004-2010 TRUCK EMISSIONS MANDATES

As shown in Table 1, the MY 2004-10 truck standards largely were designed to reduce emissions of three diesel fuel combustion byproducts; nitrogen oxides (NOx); particulate matter (PM), and non-methane hydrocarbons (NMHC). A 1998 legal settlement required seven truck engine OEMs to comply with the MY 2004 mandates two years early (MY 2002). All other engine and truck OEMs began compliance starting with MY 2004.

The second set of mandates began to phase-in in MY 2007. As shown in Table 1, they were designed to reduce MY 2002-04 emissions by roughly 90 percent. The 0.01 g/bhp-hr. PM standard took effect in 2007, with tighter NOx and NMHC standards phased in over three years.

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[1] 62 Fed. Reg. 54694, *et seq.* (October, 21, 1997); 65 Fed. Reg. 59896, *et seq.* (October 6, 2000); 66 Fed. Reg. 5001, *et seq.* (January 18, 2001). The model year for heavy-duty trucks typically begins on January 1 (*ie.*, MY 2004 runs from 1/1/04-12/31/04).

Table 1: EPA MY 2004-10 Truck Emissions Targets

Regulation	NOx	PM	NMHC
2004	2.5 g/bhp-hr	0.10 g/bhp-hr	2.5 g/bhp-hr
2007-10	1.2- 0.20 g/bhp-hr	0.01 g/bhp-hr	0.14 g/bhp-hr

To meet the MY 2002-10 mandates, engine and truck OEMs had to design, test, and incorporate a host of new strategies and technologies. Cooled exhaust gas recirculation (EGR), which reduces NOx emissions by displacing oxygen with inert gases during combustion, was the primary compliance strategy for almost all truck and engine OEMs. EGR often necessitated that changes be made to the trucks themselves (e.g., to accommodate larger cooling systems). To address tighter MY 2007-10 NOx standards, most engine and truck OEMs chose selective catalytic reduction (SCR), an aftertreatment strategy that reduces emissions by injecting a catalyst or diesel exhaust fluid (DEF) into the exhaust stream. PM emission reductions were addressed largely with aftertreatment technologies such as filters and traps.

II. THE REACTION OF NEW TRUCK CUSTOMERS TO EPA'S STANDARDS

Implementation of EPA's MY 2004-2010 emissions mandates directly resulted in higher truck prices, increased operating costs, reduced reliability, and lower fuel economy performance, which caused dramatic disruptions to the new truck marketplace. As detailed later in this paper, EPA's regulatory analyses grossly underestimated these impacts or missed them altogether.

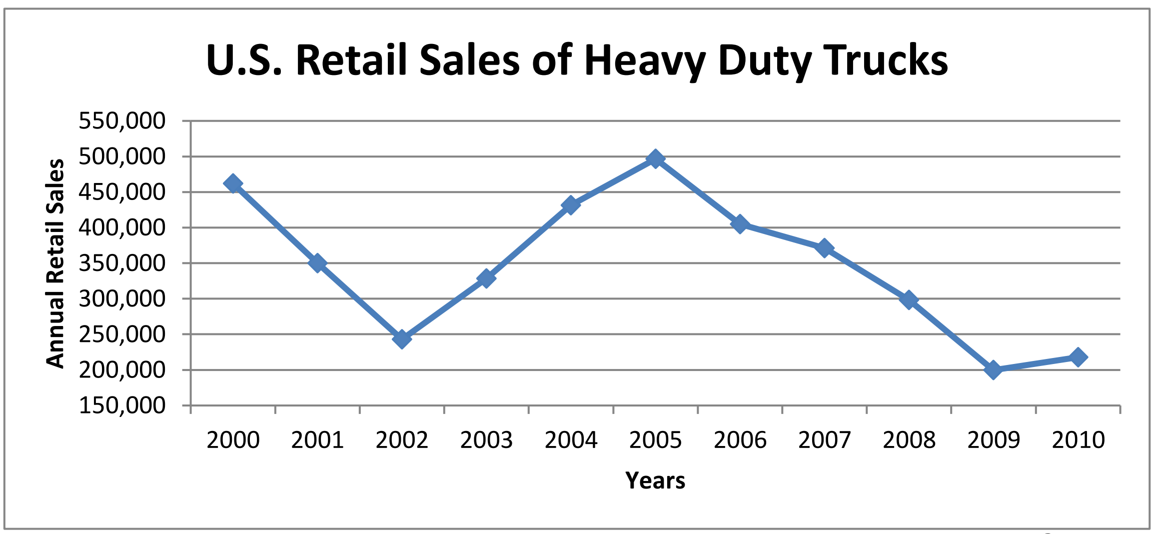

Figure 1: Annual U.S. Retail Sales for Class 4-8 Heavy-Duty Trucks.[2]

Many informed prospective new truck purchasers rushed to "pre-buy" trucks with pre-compliant technologies to avoid the effects of EPA's mandates. As seen in Figure 1 below, a surge of orders came in for pre-MY 2004 equipment, after which orders slumped significantly. Also, in 2006, orders surged for pre-MY 2007 equipment, and then fell off precipitously. Lastly, in the 2009 time-frame, orders poured in for pre-MY 2010 equipped trucks.[3] In each instance,

[2]All data from Ward's Communications.
[3] Jim Mele, *Economists See Milder Pre-Buy in '09,* Fleet Owner (January 22, 2008).

the marketplace anticipated and sought to avoid the higher prices and poorer performance of compliant technologies. As detailed later in this section, these marketplace distortions led to employment swings, capital constraints, and even some business failures[4].

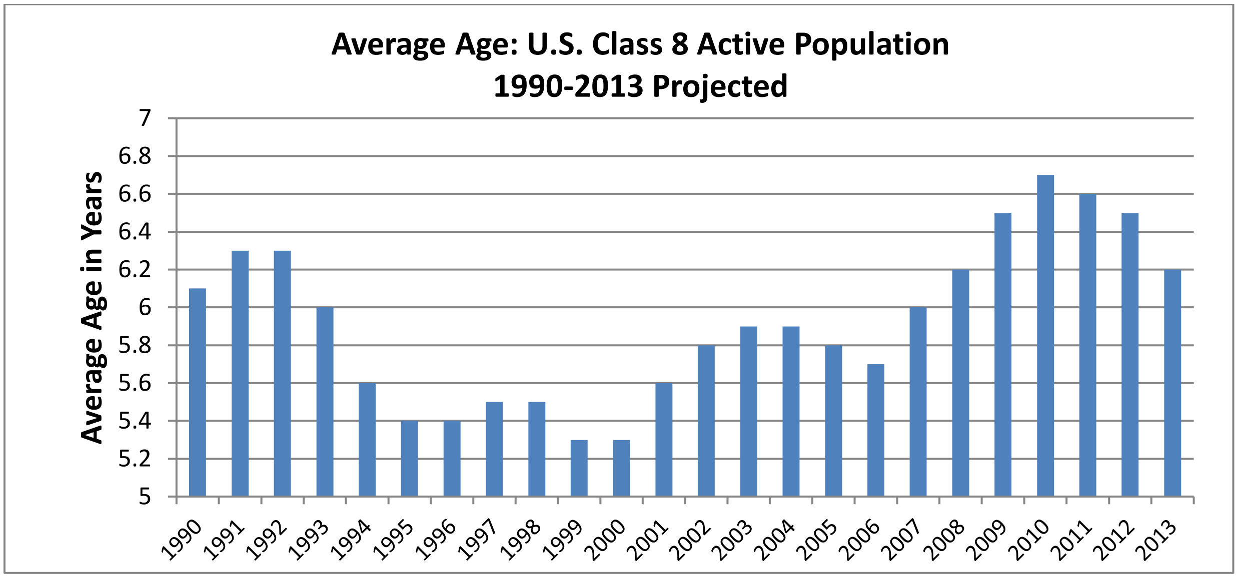

Figure 2: Average Age of Heavy-Duty Truck Fleet 1990-2013[5]

A National Economic Research Associates (NERA) survey concluded that pre-buy purchases made in anticipation of the MY 2007 standards totaled an additional 104,077 units in 2005 and 2006.[6] This was followed by a decline of 149,272 units in 2007 and 2008.[7] The pre-buy in 2009 was less pronounced and somewhat difficult to separate out from a significant decline in commercial truck demand that year related to the severity of the economic recession. In fact, sales of Class 8 trucks hit their lowest level since 1991.[8] In addition, many operators elected to hold onto their older trucks for longer than they otherwise would have, predictably incurring the higher operating costs and reliability risks of doing so. When faced with higher truck pricing and lower truck performance, prospective new truck customers acted rationally. This reluctance to buy new trucks has resulted in an aging truck fleet largely made up of trucks built prior to 2004. As evidenced by Figure 2 below, the commercial truck fleet now averages 6.6 years of age, about 11 months older than the historical average dating back to 1979.[9] This

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[4]Truck and engine OEMs temporarily or permanently exiting the heavy-duty market at least in part due to EPA's mandates include Caterpillar Inc., Sterling Trucks, General Motors Medium-Duty Truck (Chevrolet/GMC), Mitsubishi-Fuso Truck of America, Inc., Hino Trucks, and UD Trucks Co.

[5]Saum, Chairman, Beltway Companies, presentation to Diesel Technology Forum, June 17, 2011, graphic by ACT Research, LLC.

[6] NERA, *Customer Behavior in Response to the 2007 Heavy-Duty Engine Emission Standards: Implications for the 2010 NOx Standard*, page 11. (November 14, 2008).

[7] Ibid.

[8] Commercial trucks generally are categorized by gross vehicle weight rating (GVWR) and vehicle class. EPA further defines "heavy-duty vehicles" as light heavy-duty (Classes 2B-5; 8,500-19,500 GVWR), medium heavy-duty (Classes 6-7; 19,501-33,000 GVWR) and heavy heavy-duty (Class 8; 33,001and above GVWR).

[9] Daley and Clothier, *Oldest Trucks Since 1979 May Mean Output to Rise 56%,* Bloomberg (November, 19, 2010).

aging fleet of older, higher polluting trucks is counterproductive to the pollution reduction targets EPA hoped to meet with its mandates.[10]

These pre-buys and decisions by operators to keep older trucks longer had a significant economic impact. EPA acknowledged the market disruptions caused by the new regulations but waved them off as business cycle activity not necessarily related to the new emissions standards.[11] This was hardly the case as the pre-buys occurred in tandem with the new emissions mandates. For example, when faced with declining sales following the pre-buy, Volvo laid off 300 workers in March of 2001 and another 300 workers in April of that year.[12] In 2006, Volvo's Deputy Chief Executive Officer warned that the new environmental regulations would cause such a precipitous decline in sales that Volvo would have no choice but to lay off more people.[13] Volvo ended up laying off nearly 600 workers in 2006; the direct result of the new emissions mandates.[14] Also in 2006, Peterbilt cut their workforce by almost half.[15] Freightliner laid off nearly 1,800 workers in 2007,[16] followed by another layoff of 2,100 workers, and the complete shut down a manufacturing plant in 2009.[17]

Fleet purchasers echo these numbers. Fleets pre-bought new trucks in 2006 to reduce their average fleet age in preparation for the MY 2007 standards.[18] Fleet managers cited concerns over cost and decreased reliability as a main motivating factor. [19] As noted above, in addition to causing significant economic disruptions, these pre-buy/cliff cycles concurrently reduced projected environmental benefits as the adoption of new and more environmentally friendly technologies was delayed.

Other prospective purchasers turned to the used truck market.[20] Additionally, there has been a surge in truck rebuilding activity, often involving glider kits.[21] Glider kits are new truck frames and bodies typically married to used or rebuilt powertrain and suspension components. Like with used trucks, glider kits do not use new technology engines, further reducing the environmental benefits predicted by EPA to result from its standards. [22]

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[10] Thornton, Dorothy, *et. al*. *Compliance costs, regulation and environmental performance: Controlling truck emissions in the US.* Regulation & Governance (2008).
[11] Diesel Progress, *10 Questions with Margo Oge, Office of Transportation and Air Quality*, EPA (February 2007).
[12] The Roanoke Times, *More Layoffs Ahead at Volvo* (March 29, 2001).
[13] Forbes.com, *Big Trucks on a Bumpy Road* (November 16, 2006).
[14] The Sun, *Volvo to Lay Off 600 at Hagerstown Plant* (October 28, 2006)
[15] The Tennessean, *Peterbilt to Cut Ranks by Half* (November 28, 2006)
[16] Napa Valley Register, *Truck Maker Announces Layoffs* (January 28, 2007).
[17] World Truck News, *Freightliner Plans Massive Charlotte-Area Layoff* (January 28, 2009).
[18] Tire Business, *Strong Economy Bodes Well for Trucking*, (January 2, 2006)
[19] Leone, *Carriers Split Viewpoints on Benefits Of Buying Before 2010 Regulations*, Transport Topics (March 24, 2008).
[20] Owner-Operators Independent Drivers Association (OOIDA) data shows that the percentage of its members buying new trucks has dropped by 30 percent. Scott Grenerth (Professional driver and member of OOIDA), Testimony before the House Committee on Oversight and Government Reform, (October 12, 2011).
[21] Transport Topics, *Glider Kits Give New Life to Trusty, Older Trucks* (January 17, 2011).
[22] When the marketplace avoids EPA-mandated vehicles, it both diminishes projected environmental benefits and calls into question EPA's estimates of private benefits and costs. This is also a concern with EPA's MY 2017-2025 light-duty greenhouse gas (GHG) proposal and the expected second round of GHG rules for commercial trucks.

III. EPA'S PROJECTED COSTS OF COMPLIANCE

1. Fixed Costs

EPA conducted studies analyzing and projecting the effects of the MY 2004-10 rules.[23] Projected regulatory benefits included improved environmental quality and human health, while projected costs[24] focused on control strategies and technologies necessary for compliance. EPA broke out its projected compliance costs for light heavy-duty, medium heavy-duty, and heavy heavy-duty trucks and engines. Due to data constraints, this paper examines only the projected and actual compliance costs associated with medium heavy-duty and heavy heavy-duty trucks.

EPA's cost projections were made for a nine-year time frame and accounted for decreasing fixed and variable costs. As shown in Table 2 for heavy heavy-duty trucks, EPA projected that MY 2004-2005 trucks meeting MY 2004 standards would incur average costs of $803. For MYs 2006-2008, EPA projected a $688 average per vehicle MY 2004 standards compliance cost, with the decrease due to a 20 percent learning curve on fixed costs. For MYs 2009-2012, EPA projected average per vehicle MY 2004 compliance costs of $368, a decrease reflecting the expiration of fixed costs by MY 2009, and a 20 percent learning curve for variable costs.

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[23] EPA, *Final Regulatory Impact Analysis: Control of Emissions of Air Pollution from Highway Heavy-Duty Engines,* (September, 1997); EPA, *Regulatory Impact Analysis: Control of Emissions on Air Pollution from Highway Heavy-Duty Engines*, EPA 420-R-00-010 (July 2000); EPA, *Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements*, EPA 420-R-00-026 (December 2000).

[24] EPA's projected costs appear to represent an average marginal cost/per truck based on a Retail Price Equivalent (RPE) for emission control technologies. Specifically:

> Costs of control include variable costs (for incremental hardware costs, assembly costs, and associated markups) and fixed costs (for tooling, R&D, and certification). For technologies sold by a supplier to the engine manufacturers, costs are either estimated based upon a direct cost to manufacture the system components plus a 29 percent markup to account for the supplier's overhead and profit, or when available, based upon estimates from suppliers on expected total costs to the manufacturers (inclusive of markups). Estimated variable costs for new technologies include a markup to account for increased warranty costs. Variable costs are additionally marked up to account for both manufacturer and dealer overhead and carrying costs. The manufacturer's carrying cost was estimated to be four percent of the direct costs accounting for the capital cost of the extra inventory, and the incremental costs of insurance, handling, and storage. The dealer's carrying cost was marked up three percent reflecting the cost of capital tied up in inventory.
>
> EPA, *RIA*, EPA 420-R-00-026 at v-2 (December 2000).

Neither EPA's projected costs nor the actual costs discussed here-in include the application of the 12% federal excise tax or state sales taxes.

Table 2: EPA's Projected Heavy Heavy-Duty Compliance Costs (Costs are in 1999 dollars)

MY Year	2004 Standards[25]	2007-10 Standards[26]
2004	$803	N/A
2005	$803	N/A
2006	$688	N/A
2007	$688	$3,227
2008	$688	$3,227
2009	$368	$2,618
2010	$368	$2,618
2011	$368	$2,618
2012	$368	$1,866

Table 2 also shows similar EPA projections for the MY 2007-10 standards, suggesting that for MYs 2007-2008, the average per vehicle cost of compliance would be $3,227. Due to an assumed 20 percent learning curve on fixed costs, EPA projected this average per vehicle cost would drop to $2,618 for trucks built in MYs 2009-11. For MY 2012, EPA projected average per vehicle compliance costs for the MY 2007-10 standards to decline to $1,866, the result of a 20 percent learning curve applied to the variable costs.

EPA conducted similar cost projections with similar adjustment factors for medium heavy-duty trucks and engines. Table 3 shows projected average medium heavy-duty truck costs of $657 to meet the MY 2004 standards for MYs 2004-2005, dropping to $571 for MYs 2006-2008, and dropping further to $275 for trucks built in MYs 2009-2012.

Table 3: EPA's Projected Medium Heavy-Duty Compliance Costs (Costs are in 1999 dollars)

Year	2004 Standards[27]	2007-10 Standards[28]
2004	$657	N/A
2005	$657	N/A
2006	$571	N/A
2007	$571	$2,564
2008	$571	$2,564
2009	$275	$2,096
2010	$275	$2,096
2011	$275	$2,096
2012	$275	$1,412

[25] EPA, *RIA*, EPA 420-R-00-010 at 88 (July 2000). EPA only gives cost estimates for the 2004, 2006, and 2009 MYs. Based on an oral conversation with EPA staff, Table 2 uses these same numbers to fill the gaps in between.
[26] EPA, *RIA*, EPA 420-R-00-026 at V-38 (December 2000). EPA only gives cost estimates for the 2007, 2009, and 2012 MYs. Based on an oral conversation with EPA staff, Table 2 uses the same numbers to fill the gaps in between.
[27] See footnote 25.
[28] See footnote 26.

Table 3 also shows EPA's projected average medium heavy-duty truck compliance costs for the MY 2007-10 standards to be $2,564 for MYs 2007-2008, $2,096 for MYs 2009-2011, and $1,412 for trucks built for MY 2012.

2. Operating Costs

In addition to projecting direct vehicle cost increases, EPA estimated some of the indirect costs associated with its mandates, designating them as "life-cycle operating costs." According to EPA,

> Operating costs include the cost for vehicle and engine maintenance, and the cost for vehicle consumables such as fuel, oil, filters and tires. The new standards and technologies introduced beginning in 2007 are expected to change vehicle operating costs.[29]

Indeed, EPA estimated increased life-cycle operating costs of $3,785[30] for a MY 2007 Class 8 truck, in *addition* to a $3,227 higher up front price. This paper does not attempt to compare EPA's estimated life-cycle operating costs to actual operating costs. However, data suggests that DPF and trap maintenance intervals have occurred much more often than projected, at $300-500 per service. This is particularly true for units in vocational use.[31] Moreover, the lost earnings associated with trucks out of service, due to reliability issues, far exceed any service and parts costs associated with these mandates. As discussed below, real and perceived increased operating costs, along with real and perceived declines in performance, significantly contributed to the marketplace disruptions arising from EPA's standards.

IV. ACTUAL PER TRUCK COMPLIANCE COSTS VS. EPA COST PROJECTIONS

Actual individual sales data and widely reported pricing information paint a clear picture of the higher per truck costs resulting from compliance with EPA's mandates. The primary data used in this paper to analyze actual per truck costs were individual sales invoices and OEM sales documents covering truck sales involving the majority of heavy-duty truck and engine OEMs.[32] Many invoices contained specific cost line items (surcharges or escalators) delineating cost increases attributable to the MY 2004-10 mandates. These surcharges are understood to reflect the wholesale costs (to the dealer) of the emission reduction strategies and technologies used. They do not include dealer mark-ups (if any) or taxes.

For example, certain Western Star truck invoices listed specific escalators labeled "2002/2004 Engine Emissions Escalator...$4,148.00." and certain Volvo invoices read "2007 EPA surcharge net/net no discount…$7,500" A November 20, 2009, Peterbilt dealer bulletin detailing 2010 pricing read, in part:

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[29] EPA, *RIA*, *EPA 420-R-00-026* at V-29 (December 2000).
[30] EPA life-cycle operating costs, in 1999 dollars, do not include increased fuel economy costs.
[31] Steve Sturgess, *2010 DPF Maintenance,* Trucking Info (January 22, 2010).
[32] The number of surcharge data points do not represent all potentially available data for all regulated truck OEMS, but rather data readily available from surveyed dealers.

Effective with the January 1, 2010, price level, a surcharge will be added to the invoice for chassis built with a 2010 EPA emissions compliant after-treatment. This surcharge is non-discountable and will be applied as follows: ISX…$9,250 Surcharge…ISL, PX-8, PX-6 - $7,000.

Figure 3 below shows the average surcharge, by OEM, for MY 2010 compliant heavy heavy-duty trucks. These escalators account only for costs associated with the MY 2010 round of emissions mandates. According to vehicle/engine manufacturers, compliance costs associated with the MY 2004 and MY 2007 mandates were incorporated into base invoice price of MY 2010 compliant trucks.[33] The EPA comparative cost projection shown also does not include compliance costs for the MY 2004 and MY 2007 standards. *On average, actual cost increases for MY 2010 compliant heavy heavy-duty trucks were nearly three times what EPA projected*.

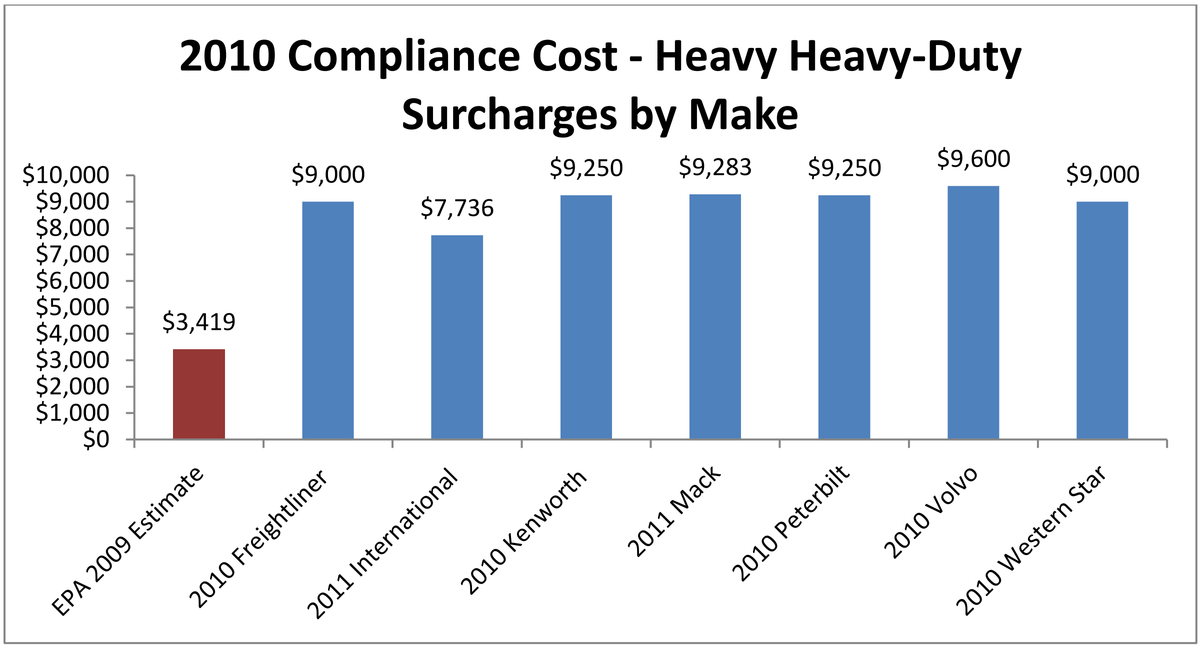


Figure 3: 2010 Compliant Heavy Heavy-Duty Surcharges by OEM.[34]

Figure 4 below shows the average MY 2010 surcharge, by OEM, associated with MY 2010 compliant medium heavy-duty trucks. Again, EPA's projection, provided by comparison,

[33] In other words, the surcharges only account for the costs associated with meeting a specific level of emission standards. For example, the 2004 surcharge accounts for the 2.5 g/bhp-hr NOx standard (figure 6), the 2007 surcharge accounts for the 1.2 g/bhp- hr NOx standard (figure 5), and the 2010 surcharge accounts for the 0.20 g/bhp- hr NOx standard (figures 3 & 4). In order to calculate total regulatory costs, these incremental costs must be added together.

[34]The X-axis lists truck OEMs and year of invoice. The Y-axis lists per vehicle regulatory compliance premiums. Dollars are standardized to 2010 with surcharges adjusted for inflation. The EPA estimate is a MY 2009 projection made in December 2000, inflation adjusted. This is used because EPA only made per vehicle cost increase estimates for MY 2007, 2009, and 2012. Figure 3 uses the 2009 cost increase to be conservative, since using the 2012 estimate would likely undervalue EPA's cost predictions for MY 2010 trucks.

does not include MY 2004 and MY 2007 compliance costs. *On average, actual cost increases for MY 2010 compliant medium heavy-duty trucks were over two times what EPA projected.*

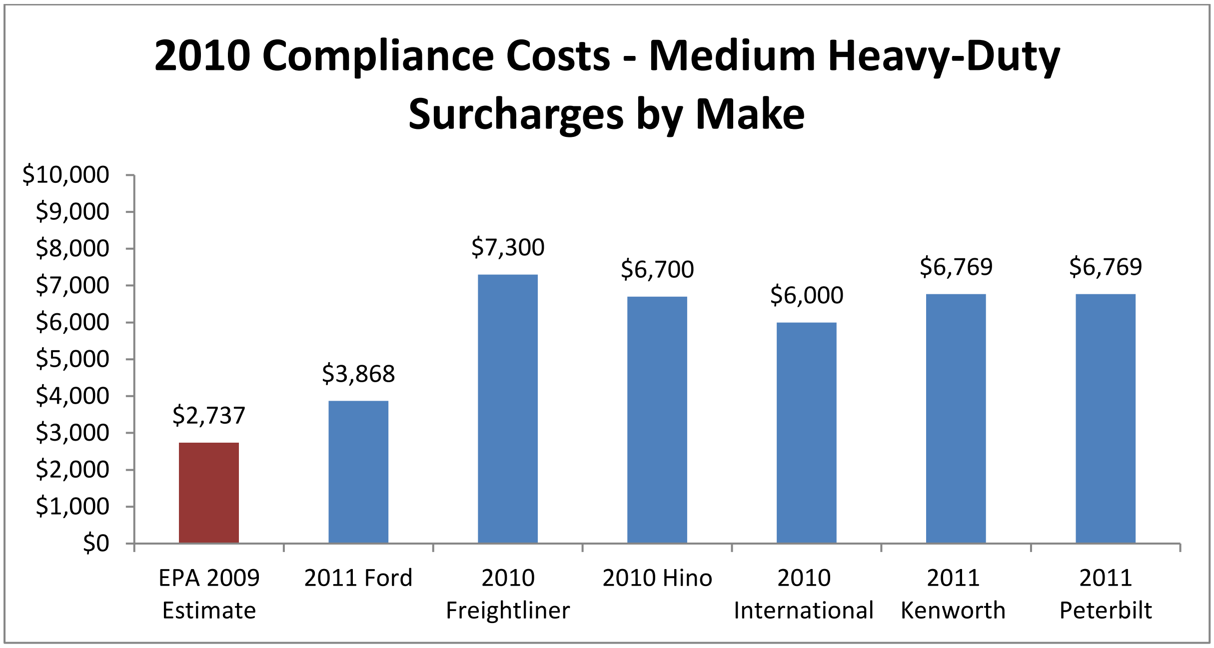
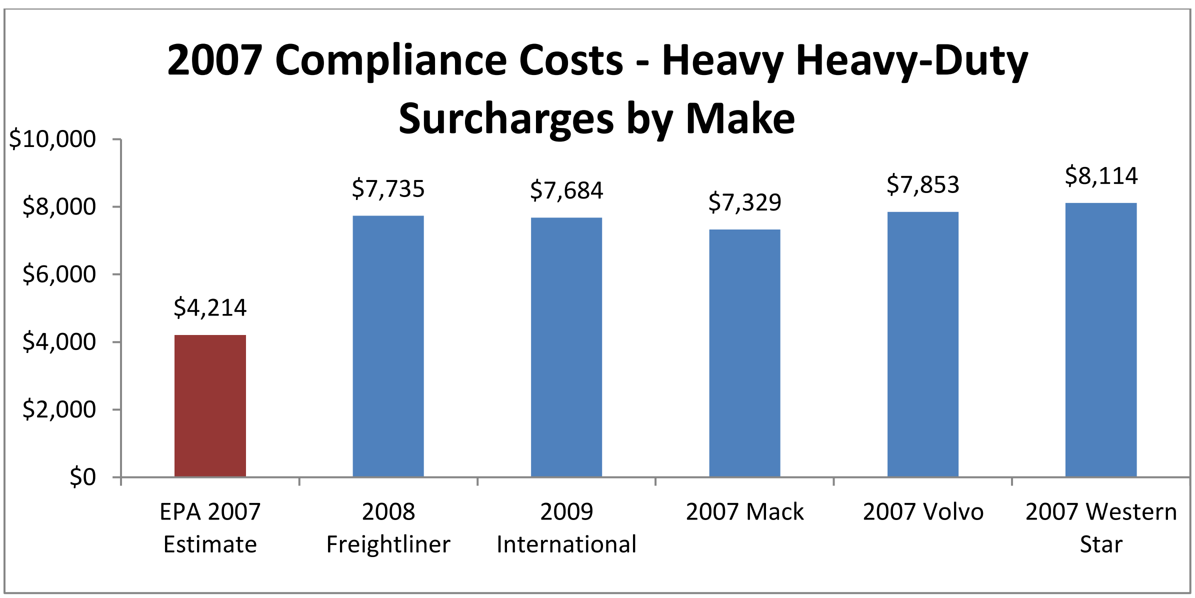


Figure 4: 2010 Compliant Medium Heavy-Duty Surcharges by OEM.[35]

Figure 5 below shows the average MY 2007 surcharge, by OEM, associated with MY 2007 compliant heavy heavy-duty trucks. Again, EPA's projection, provided by comparison, does not include MY 2004 compliance costs. *On average, actual cost increases for MY 2007 compliant medium heavy-duty trucks were nearly two times what EPA projected.*



[35] Please see foot note 34.

Figure 5: 2007 Compliant Heavy Heavy-Duty Surcharges by Truck OEM[36]

Figure 6 below shows the average MY 2004 compliant surcharge, by OEM, associated with MY 2004 compliant medium heavy-duty trucks, along with EPA's projection. *On average, actual cost increases for MY 2004 compliant heavy heavy-duty trucks were up to five times what EPA projected.*

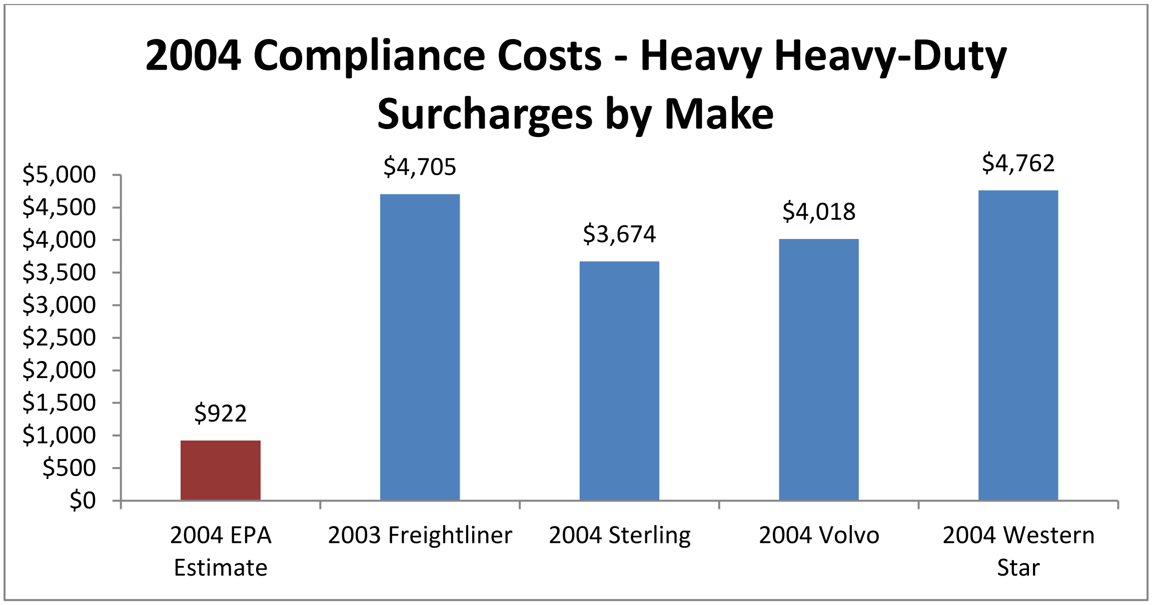


Figure 6: 2004 Compliant Heavy Heavy-Duty Surcharges by Truck OEM[37]

Figures 3-6 show that EPA's cost analyses underestimated *by two to five times* the actual costs of compliance with the MY2004-10 truck emissions mandates. As shown in Figure 7 below, it is possible to total up average per truck compliance costs for the MY 2004-2010 standards. According to representatives from various manufacturers, this comparison is appropriate because, as described above, each round of surcharges does not include costs incurred to comply with the prior round(s) of emissions mandates. *A comparison of EPA's total projected costs for heavy heavy-duty trucks versus actual data for four OEMs shows that on average, actual cost increases were 4 times what EPA projected.*[38]

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[36]The X-axis lists truck OEM and year of invoice. The Y-axis lists the per vehicle regulatory compliance premium. Dollars are standardized to 2010 with surcharges adjusted for inflation. Notably, a 2005/2008 retrospective study conducted by NERA Economic Consulting and Air Improvement Resource, Inc. similarly projected that, on average, heavy heavy-duty truck prices would increase by $7,000 to meet the MY 2007 standards.

[37] The X-axis lists truck OEM and year of invoice. The Y-axis lists the per vehicle regulatory compliance premiums. Dollars are standardized to 2010 with surcharges adjusted for inflation. EPA's MY 2004 estimate is based on its first year projection for a MY 2004 compliant vehicle. See Table 3. The 2003 Freightliner invoice is comparable to the MY 2004 EPA as both reflect compliance with the same standard.

[38] OOIDA attempted to calculate a total average per truck regulatory cost figure associated with the MY 2004-2010 standards. OOIDA's analysis, based on MSRP values and increased warranty costs, calculates that EPA's rules caused truck prices and warranty costs to increase an average of $20,000-30,000. Scott Grenerth (Professional driver and member of OOIDA), Testimony before the House Committee on Oversight and Government Reform, (October 12, 2011).

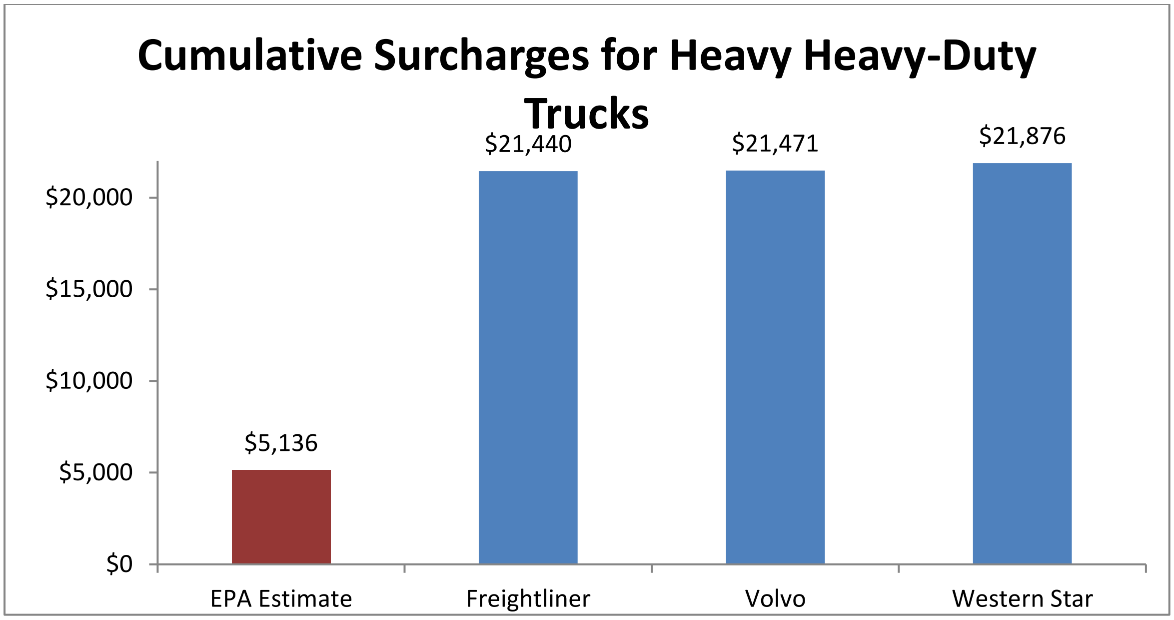

Figure 7: EPA Projection of Total MY 2004-2010 Heavy Heavy-Duty Compliance Costs Compared To Actual Total Surcharges for Three OEMs[39]

V. OTHER CONCERNS ARISING OUT OF EPA'S MY 2004-2010 TRUCK EMISSIONS MANDATES THAT CONTRIBUTED TO MARKETPLACE DISRUPTIONS

1. Decreased Truck/Engine Reliability

In 2000, EPA stated that, "engine manufacturers have been very successful in developing a mix of technologies to lower PM and NOx concurrently while continuing to improve fuel economy and engine durability."[40] This may have been the case up until the MY 2004-2010 standards took effect, but experience with their implementation paints a different picture. Particularly with respect to trucks and engines designed to meet MY 2004 and 2007 standards, fleets and owner-operators have experienced significant reliability, operating cost, and fuel economy concerns. A recent J.D. Power and Associates study suggests that:

> With the new technology required to meet emissions standards, today's engines simply are more problematic than the previous generation. So, while it's possible that manufacturers can continue to improve the quality of the engines, it's unlikely that they'll quickly get back to the pre-2004 levels.[41]

J.D. Power's conclusions are supported by individual fleet experiences. For example, it has been reported that for the eighth largest carrier in the U.S., "maintenance costs for Schneider's 2007

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[39] EPA's estimate is the sum of projected MY 2004, 2007, 2010 costs. Actual compliance cost totals are the sum of each OEM's MY 2004, 2007, and 2010 surcharges. All numbers are adjusted for inflation to 2010 dollars. The three OEMs shown are the only ones for which surcharge data was available for all three compliance rounds.
[40] EPA, *RIA*, EPA 420-R-00-010 at 26 (July 2000).
[41] J.D. Power, *Heavy-duty Engine Quality, Satisfaction Up Since Last Year,* Commercial Carrier Journal (September 1, 2011)

model trucks were about 28.2% higher than vehicles manufactured before October 2002."[42] Reliability is critical for commercial fleets and owner-operators both because of the costs of keeping trucks in operation and the even greater potential costs associated with out-of-service equipment.[43] In addition to higher truck prices and operating costs, anticipated reliability issues are often cited as contributing to the marketplace disruptions discussed herein.[44]

2. Decreased Fuel Economy Performance

For its MY 2004 rule, EPA projected that fuel injection and variable geometry turbochargers would offset the fuel economy penalties of EGR systems. In fact, EPA even projected that its MY 2004 rules would decrease fuel consumption by as much as 1.5 percent.[45] For its MY 2007-2010 rule, EPA projected no declines in fuel economy performance.[46]

EGR systems may be effective at reducing NOx emissions, but they undeniably reduce the fuel economy performance that would otherwise have been achieved. For example, Judy McTigue, director of marketing and planning research for Kenworth Trucks, stated that "2007-compliant engines equipped with exhaust gas recirculation systems suffered a fuel economy penalty of 5% to 9%."[47] EGR systems also contributed to a loss of 50 to 100 horsepower from heavy-duty engines.[48] According to OOIDA, this fuel economy penalty equates to a truck consuming an extra 800 additional gallons of fuel per year, on average.[49] At $4.00/per gallon, that is an extra $3,200/year/truck that EPA failed to account for in its projections. In addition, EPA also failed to account for the proportionate amount of extra GHGs emitted, ironic given that the agency has since issued a rule governing GHGs from commercial trucks and is in the process of developing a second. Not unlike reliability concerns and higher prices, lower fuel economy performance is often cited as a major reason why fleets and owner-operators avoided purchasing trucks equipped with engines designed to meet the MY 2004 and 2007 standards. Subsequent introduction of SCR has mitigated EGR-related fuel economy performance degradations, but the new truck fleet has yet to reach pre-MY 2004 fuel economy levels.[50]

VI. LESSONS LEARNED: EXPLAINING EPA'S GROSS UNDERESTIMATIONS

In light of the dramatic marketplace impacts that directly resulted from the actual regulatory costs associated with EPA's MY 2004-2010 truck emissions mandates, it is

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[42] Leone, *Carriers Split Viewpoints on Benefits Of Buying Before 2010 Regulations*, Transport Topics (March 24, 2008).
[43] Scott Grenerth (Professional driver and member of OOIDA), Testimony before the House Committee on Oversight and Government Reform, (October 12, 2011).
[44]Deborah Lockridge, *The Pre-Buy Ride*, Heavy Duty Trucking (August, 2007).
[45] EPA, *RIA*, *EPA 420-R-00-010* at 85 (July 2000).
[46] EPA, *RIA*, EPA 420-R-00-026 at V-29 (December 2000).
[47] Fleet Owner, *Dealing with DEF*, (October 22, 2010).
[48] Ibid
[49] U.S. House, Committee on Oversight and Government Reform, Sub-Committee on Regulatory Affairs, Stimulus Oversight, and Government Spending, *Running on Empty How the Obama Administration's Green Energy Gamble Will Impact Small Business &* Consumers, Hearing (October 10, 2011).
[50]Volvo Trucks North America, *SCR and Fuel Efficiency* (2009)

incumbent upon the agency to review and resolve the flaws with its cost projection methodology. By misjudging future regulatory costs, EPA (and other agencies) not only give an inaccurate picture of the negative impacts arising from those costs, but also overstate potential benefits. In this case, the dramatic new truck sales disruptions resulted in a delay of the environmental benefits projected for the "timely" introduction of cleaner engine-equipped trucks. As stated above this paper makes no attempt to quantify the actual benefit reductions associated with real-life compliance, however, the fact that they were significantly reduced is undeniable.

1. Long-Lead Time Rulemakings: A Mixed Blessing

EPA began to analyze the costs and benefits of its MY 2004-2010 truck emissions mandates in 1997. At the time, the agency touted the positive aspects of codifying future mandates well before they are to take effect by stating:

> In previous rules to set heavy-duty engine emission standards, EPA has typically allowed engine manufacturers about four years of preproduction lead time. This four-year lead time, the period called for in the Clean Air Act, has given manufacturers sufficient opportunity to complete the research, development, retooling, and certification efforts necessary to comply with promulgated emission standards. The requirements for the 2004 model year do not follow this pattern. The Statement of Principles and the Advance Notice of Proposed Rulemaking gave the engine manufacturers a good idea of the level of the emission standards and other related requirements a full eight years before 2004.[51]

Longer than necessary lead times are beneficial in principle, but can have significant unintended consequences where "technology forcing" standards are involved and compliance depends on hard-to-predict variables. All things being equal, the further away projections occur from an intended effective date, the less likely an agency will be able to accurately predict which technologies and strategies will be used, what they will cost, and whether and what degree they will be affordable and acceptable to potential customers.

2. NOx Reduction Technologies

The Regulatory Impact Analysis (RIA) for EPA's MY 2007-2010 rules was drafted in 2000, a full seven to ten years before actual implementation.[52] EPA recognized then that while enhanced EGR would serve as the primary NOx reduction compliance technology for the MY 2004 emissions standards, it would be insufficient to meet the more stringent MY 2007-2010 mandates. In 2000, EPA predicted specifically that, in conjunction with EGR, NOx adsorbers would be needed to achieve the 0.20 g/bhp-hr target. EPA did not predict and thus did not project the costs associated with SCR, the emission control strategy ultimately elected by most OEMs. EPA did not focus on SCR because, at the time, the agency lacked the assurances necessary to approve it as an enforceable approach. EPA was concerned specifically with urea

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[51] EPA, *Final Regulatory Impact Analysis: Control of Emissions of Air Pollution from Highway Heavy-Duty Engines*, at 83 (September 1997).
[52] EPA, *RIA*, EPA 420-R-00-026 (December 2000).

infrastructure issues and user compliance mechanisms.[53] Despite an officially neutral stance, EPA indicated a bias for NOx adsorbers over SCR,[54] publically acknowledging its difficulty in recognizing that NOx adsorbers would have anything but wide application to address MY 2010 standards.[55]

EPA's support for NOx adsorbers arose out of a preference for hardware-only solutions versus approaches involving both hardware and operator input. This bias conflicted with significant OEM preferences for SCR, in part based on experience with using the technology in Europe.[56] In the end, most engine OEMs elected to adopt SCR technology to meet the MY 2010 0.20 g/bhp-hr target, consistent with policies issued by EPA.[57]

The NOx adsorber vs. SCR experience supports two points:

1. The further out in time compliance dates are set and the further ahead technologies and strategies are analyzed, the greater the likelihood projections will be wrong. Such uncertainties may be reduced by, among other things, providing for, analyzing, and projecting a range of potential compliance options.

2. Uncertainties inherent in cost/benefit analyses may be reduced by shortening the time frames in question and by providing for a range of costs and benefits for any given technology or strategy analyzed. Obviously, the SCR NOx reduction strategy, never rigorously analyzed in the EPA RIAs associated with these standards, ended costing significantly more to implement than what EPA projected NOx adsorbers would cost.

VI. CONCLUSION

All regulatory mandates have consequences, some intended and recognized, others either unintended or ignored. These consequences often involve real costs to the regulated entities and to, as in this case, related parties such as customers and employees. Forecasted public and private benefits can end up being dramatically overstated. Thus, it is incumbent upon EPA (and all regulatory agencies) to properly analyze, characterize, and project the costs and benefits of its proposals, especially where long lead times and production mandates are involved. Failing to do so only serves to undermine the efficacy of the regulatory process.

In this instance, EPA underestimated the up-front cost premiums associated with its truck mandates by a factor of 2-5 times. In addition, EPA also failed to accurately analyze and project

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[53] Johnson, *EPA Quietly Works Against Promising Engine Technology,* Transport Topics (January 6, 2003).
[54] Ibid.
[55] Malloy, *2010 Options Could Force Radical Leap,* Transport Topics (March 15, 2004).
[56] SCR is 'the only solution on earth today' that will meet the new regulations, said Pierre Lecoq, SVP, Global Product Development, Volvo Powertrain in Abramson, *Volvo Says SCR the Only Way to Meet 2010 Emission Rules,* Transport Topics (October 18, 2004); "DDC [Detroit Diesel Corporation] and Freightliner LLC, the nation's largest producer of Class 8 trucks, and others favor the use of urea because it can boost fuel economy in trucks and help achieve EPA's emissions targets for 2007" in Wislocki, *Urea supporters ready to seek EPA approval for SCR engines,* Transport Topics (September 8, 2003).
[57] See *e.g.*, 76 Fed. Reg. 312886, *et seq*. (June 7, 2011).

higher truck operating costs, reduced truck reliability, and lower truck fuel economy performance. Consequently, EPA's mandates resulted in significant and costly marketplace disruptions and reduced regulatory benefits. Notably, dealers are beginning to see instances of emissions tampering in their shops and on their used truck lots, suggesting how aggressive mandates also may not achieve desired benefits.

Unless mandated by statute, EPA should avoid promulgating mandates many years in advance covering long time periods as doing so necessarily involves uncertainty regarding key factors influencing the cost and performance of compliance strategies and technologies.