

# Policy Considerations: Emissions Reduction Proposals Affecting Medium and Heavy-Duty Vehicles

DECEMBER 2022

Medium and heavy-duty vehicles (MHDV) account for approximately 10% of vehicle miles traveled in the United States, distribute nearly three-quarters of the nation's freight and contribute 24% of the nation's transportation-related greenhouse gas (GHG) emissions (often expressed as carbon dioxide, or CO<sub>2</sub> equivalent, or simply carbon) as well as a significant share of air pollutant emissions. In the quest to reduce emissions from the transportation sector, policymakers are beginning to explore options that will directly affect this sector. However, the MHDV market presents unique conditions not found with light duty passenger vehicles, which must be taken into consideration when contemplating any emissions reduction policy.

To help policymakers and affected stakeholders better understand the particular effects such initiatives might have on the MHDV market, the Fuels Institute compiled the following considerations that are critical to address when crafting and implementing such policies. Given the role of MHDVs to the general economy, especially as it relates to the distribution of goods and the provision of services, the Fuels Institute is dedicated to informing comprehensive discussions about the various policy options available to balance the various needs of the market while achieving significant reductions in transportation emissions.

## General Considerations

When considering policies to reduce emissions from the transportation sector, there are some general topics that must be taken into consideration with specific attention paid to how they affect the MHDV market.

- **Clarify Policy Objectives:** When developing policies to reduce emissions, policymakers should make their objectives clear and then carefully evaluate a policy's provisions to ensure they support these objectives. By doing so, policymakers can better support coordinated efforts among government agencies and industry stakeholders to achieve their objectives within the designated time frame.
- **Life Cycle Emissions:** With respect to carbon, emissions can and do occur throughout the life cycle of all vehicles and their fuel/energy sources, from material extraction through manufacture, distribution, operation and end of life. When considering policies to eliminate carbon emissions, it is necessary to consider the entire life cycle and find opportunities to reduce emissions at each point.<sup>1</sup> Life cycle analytical models, like Argonne National Laboratory's GREET model, provide valuable insight to help policymakers develop effective strategies to address life cycle emissions. Policymakers should leverage such insights as they take a life cycle approach to carbon mitigation and schedule the implementation of policies to align and take advantage of the evolution of low carbon energy options.

<sup>1</sup> For more information on life cycle analysis, see <https://www.fuelsinstitute.org/research/reports/life-cycle-analysis-comparison-electric-and-internlife-cycle-analysis-comparison-electric-and-intern>

- **Electricity System Capability:** Policies that seek to expand the utilization of electric powertrains in MHDVs should take into consideration the additional electricity that will be required to support a large fleet of MHDV battery electric vehicles (BEV). Ensuring the sufficient generation of low carbon electricity and the requisite distribution capacity to support these vehicles should be incorporated in policy development. It also is important to ensure the grid is properly equipped to support the instantaneous electrical loads associated with charging these larger vehicles. Policymakers must understand the capabilities and limitations of electric utilities as they seek to support the necessary charging infrastructure, recognize the lead time required to do so and consider conditioning the implementation timeline of a policy upon the achievement of key milestones to ensure electric vehicle energy demand does not overwhelm the system.
- **Infrastructure Development:** A policy seeking to accelerate the transition to alternative vehicles must provide for the rapid expansion of infrastructure to deliver sufficient transportation energy where it will be needed, especially considering the important contribution MHDVs make to the economy. This includes electricity distribution and vehicle charging stations, hydrogen production, distribution and refueling stations, and other qualified energy sources (such as natural gas and biofuels) that could support a lower emissions transportation sector. When contemplating the infrastructure that may be required, taking into consideration issues such as resiliency and market redundancy can help assure reliable access to necessary energy for drivers. In addition, it should be recognized that alternative energy infrastructure can represent a capital investment as well as a potential increase in operating expenses. For example, with regards to EV charging, the level of electricity that will be required to power MHDVs (perhaps up to and beyond a megawatt per unit) could trigger significant demand charges from the utility to ensure sufficient power is available at each facility. Additional operating expenses like these could impede the deployment of necessary infrastructure and should be considered in policies seeking to support such deployment. Requisite infrastructure is another area in which it might be reasonable to condition a policy's implementation schedule upon the achievement of key milestones.



## Fleet Diversity

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The MHDV market is not like the light-duty vehicle market. It serves a much more diverse set of customer needs with drastically different payloads and daily routes. This creates a highly varied market often with relatively limited opportunities for scale. Therefore, the following characteristics of the MHDV market should be taken into consideration when developing policies that will affect these vehicles.

- **Vehicle Utilization:** A recent report from the Fuels Institute<sup>2</sup> evaluated the various demands put on the MHDV market and concluded that 91% of these vehicles are deployed in 17 distinct and unique applications. Understanding the utilization and life cycle of these vehicles will contribute to better policy. Some key factors that distinguish vehicle categories include, among others:
  - **Application:** MHDVs can be deployed in a variety of use cases and operated on various duty cycles. From long-haul and regional cargo vehicles to transit, construction and emergency service vehicles, the energy needs to support a vehicle's overall operation can vary significantly. In addition, the operating cycle and regionality of a service area can greatly influence how policies can be implemented and how compliance might be measured. For example, applying an emissions per mile standard may be applicable to some vehicle applications whereas it might be more appropriate to account for tons of freight moved within other applications. In addition, commercial vehicles often travel across regulatory jurisdictions. When policies between jurisdictions (such as vehicle axle weight limits) are not coordinated, this can greatly impede the ability of a vehicle owner to maximize the efficient operations of a fleet.
  - **Ownership Periods:** While some heavy-duty vehicles are designed to run for more than 700,000 miles, the number of vehicle owners during that period depends largely on the business strategy of the individual operators. Consequently, ownership periods can be very short or very long, influencing the return on investment for new technologies as well as the turnover rate of the MHDV fleet.<sup>3</sup> The durability of these vehicles also contributes to a robust used vehicle market, which also must be taken into consideration when developing policies. Understanding these dynamics will help policymakers craft provisions that will accelerate the transition to lower carbon options.
  - **Fuel/Energy Availability:** Fleet operators with vehicles deployed in duty-cycles that return to a central base each night may be able to supply their own energy for their vehicles and therefore might be more adaptable to new fuel or technology options. However, those that do not have access to a proprietary energy supply will be dependent upon the business decisions of retail energy providers to offer the required energy (i.e., electricity, hydrogen, natural gas, biofuels, etc.) and could be more hesitant to make such a transition until such retailers invest in the necessary infrastructure. Understanding these unique needs and perspectives can result in more effective policies.
  - **Auxiliary Energy Needs:** MDHVs often have power needs beyond propulsion, such as operating refrigeration units, driver hoteling accommodations or stationary equipment operations. These affect the overall energy needs of the vehicle and must be considered in any policy affecting vehicle choice.

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<sup>2</sup>For additional details, see <https://www.fuelsinstitute.org/Research/Reports/Decarbonizing-Medium-and-Heavy-Duty-Vehicles>

<sup>3</sup>For example, pending emissions regulations seek to extend the defined useful life of some vehicles (such as Class 8 trucks) from less than 500,000 to more than 700,000 miles.

- **Vehicle Ownership:** Ownership and ultimate responsibility for a MHDV is not always simple. Many vehicles are owned and operated by small businesses with limited access to capital, which affects their ability to acquire new vehicles and new technology. In fact, according to the Federal Motor Carrier Safety Administration, 95.7% of all commercial carriers operate 10 or fewer vehicles. To that end, the resiliency of the used vehicle market is essential, especially with regards to second and third owners of new technology vehicles. Often the vehicles in a fleet are not owned by the operator but are acquired via lease from national fleet providers, which may or may not adjust their vehicle offerings to accommodate regional regulatory requirements. How new technology is acquired and distributed is unique in different MHDV fleet situations and should be understood and accommodated when crafting policy.
- **Low Emissions Options:** Due to their size and unique duty cycles, many MHDVs have more options to lower their emissions than light duty passenger vehicles. Enabling and encouraging viable emissions reduction options should be part of any policy consideration for the MHDV market. For example, extremely low carbon liquid fuels (such as biodiesel and renewable diesel) are already available in the market and, when combined with advanced engine design, can deliver near-zero emissions capabilities today. In addition, combustion engines using fuels like compressed and liquefied natural gas, hydrogen and renewable natural gas offer the potential to deliver near zero or potentially even negative carbon operations on a life cycle basis. These are options available to legacy and new-to-market vehicles. At the same time, new technologies, like BEVs and FCEVs (Fuel Cell Electric Vehicles), are being deployed in many duty cycles within the MHDV market with great success. These are only examples of the diversity of available and emerging options and represent opportunities to significantly reduce emissions from the MHDV fleet in the near and long term.



## Economic Implications

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The MHDV market is a critical component of the economic activity and functionality of a market. Costs incurred by vehicle owners are transferred to the economy at large and have implications for consumers. Policymakers should consider provisions to offset some of these concerns, which include, among others:

- **Transfer of Costs:** MHDVs are critical to the distribution of consumer goods and the provision of essential services within communities. Emissions reduction options that do not provide for a return on investment to the vehicle owner may result in the transfer of costs to the customers and communities these vehicles serve. Policymakers should consider including provisions that could mitigate the potential economic effect on vehicle owners and operators as well as their customers.
- **Cost of Vehicles:** The price for acquiring some lower emissions MHDVs can be significantly higher than those equipped with traditional powertrains. Importantly, while some vehicle use cases might experience a total cost of ownership advantage associated with some lower emissions options, there remains uncertainty regarding the economic implications of these options in different applications. In addition, given the diversity of fleet size and ownership models, not all operators will be able to invest in some lower emission options. If new vehicle costs result in a reduction in the rate of vehicle replacement, legacy vehicles will remain in operation for a prolonged period of time, slowing progress on reducing emissions with newer vehicles. Policies should consider options for mitigating the economic implications of lower emissions strategies.
- **Fuel for Legacy Vehicles:** Policies designed to encourage the transition to new technologies could affect decisions by fuel providers to invest in supplies and infrastructure to service the legacy fleet. Considering the rate of MHDV fleet turnover, the expected useful life of these vehicles and the heavy reliance on the used vehicle market for many fleet operators, policymakers must think about how to ensure access to reliable and affordable transportation energy for legacy vehicles. Failure to ensure liquid fuel availability could significantly affect fleet operators, strand assets and stress the commercial product distribution and service network by removing essential legacy vehicles and operators from the market before alternatives are available to replace the services they provide.
- **Vehicle Inventory and Miles Traveled:** When considering policies to reduce emissions, attention should be directed to the implications of strategies on the vehicle inventory and route selection required to satisfy the needs of the market, as well as the cargo capacity of a given vehicle. Policymakers should take into consideration how policies might affect overall vehicle miles traveled, the number of vehicles on the road (i.e., traffic congestion), the availability and utilization of alternative modes of transport and possible solutions to enhance the environmental benefits and mitigate potential economic implications of a policy.
- **Vehicle Weight:** Some of the new powertrain options for MHDVs could add significant weight to the vehicle, which could reduce the cargo capacity of commercial vehicles due to road weight restrictions. This could affect the economic model for these businesses and potentially increase congestion by increasing the number of vehicles and/or trips required to achieve similar results. Policymakers should consider the business implications of the emissions reduction strategies and provide options to balance the two priorities. For example, adjusting cargo weight and/or volumetric limitations can enhance the work capacity of lower emissions vehicles. In considering such options, coordination with motor vehicle safety standards is critical. This is one example in which emissions reduction strategies must be evaluated to understand how they intersect with other regulatory requirements and to determine how regulations can be better coordinated in support of the desired objective.



## Summary

The MHDV market is complex and diverse and should be addressed with policies specifically tailored to its unique characteristics. Because the majority of these vehicles are directly engaged in the economy, policies can have much broader implications than on the vehicles themselves – they can affect the delivery and affordability of consumer goods and critical community services. They also have the potential to vastly improve air quality in regions with high traffic and dense populations. Consequently, policies should be crafted carefully with specific attention to the unique characteristics of the MHDV market.

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Founded by NACS in 2013, the Fuels Institute is a nonprofit tax-exempt social welfare organization under section 501(c)(4) of the Internal Revenue Code. We are dedicated to evaluating issues affecting the vehicles and fuels markets. We commission comprehensive, fact-based research projects that are designed to answer questions, not advocate a specific outcome. Our reports address the interests of industry stakeholders—from business owners making long-term investment decisions to policymakers considering legislation and regulations that affect these markets.

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