

Review of Commitments for Zero-Emission Medium- and Heavy-Duty Vehicles

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December 2021

In the wake of the 2021 United Nations Climate Change Conference, referred to as COP26, leading nations are accelerating their ambitions to reduce the impact of greenhouse gas (GHG) emissions on the environment from a historically challenging source: medium- and heavy-duty vehicles (MHDVs). In the cornerstone World Energy Outlook report, the International Energy Agency (IEA) makes an urgent call to countries to curb the use of fossil fuels across all sectors if the goal of keeping global temperatures from rising 1.5°C above pre-industrial levels is to be met (IEA, 2020). The report lays out the path forward stating that we must reach net-zero carbon emissions globally by the year 2050. As part of the roadmap to net zero, the transportation sector is recognized as a major driver of GHG emissions and other harmful pollutants, especially the largest and heaviest vehicles on the road. In the United States alone, the transportation sector accounts for 26% of all energy consumption, making it a major target for reductions.

Globally, MHDVs (freight trucks and buses) represent about 4% of the on-road fleet but are responsible for approximately 36% of on-road fuel consumption and respective GHG emissions. These vehicles emit 73% of on-road nitrogen oxide (NOx) emissions and 60% of particulate matter (PM2.5) emissions, which result in smog-forming air pollution and have detrimental impacts to human health (CALSTART, 2020). Based on the data, MHDVs add a disproportionate share of pollution to the mix when compared to passenger cars and other light-duty vehicles. Considering the renewed calls to action by organizations like the IEA, it is a high priority to review the policy and commitments for zero-emission MHDVs established by leading nations to curb emissions from road transportation so that ambitions can be strengthened and

necessary adjustments can be made. Nations must set clear targets to reduce emissions from MHDVs to solidify the trajectory of the market and drive accelerated action by manufacturers, fleet operators, and infrastructure providers.

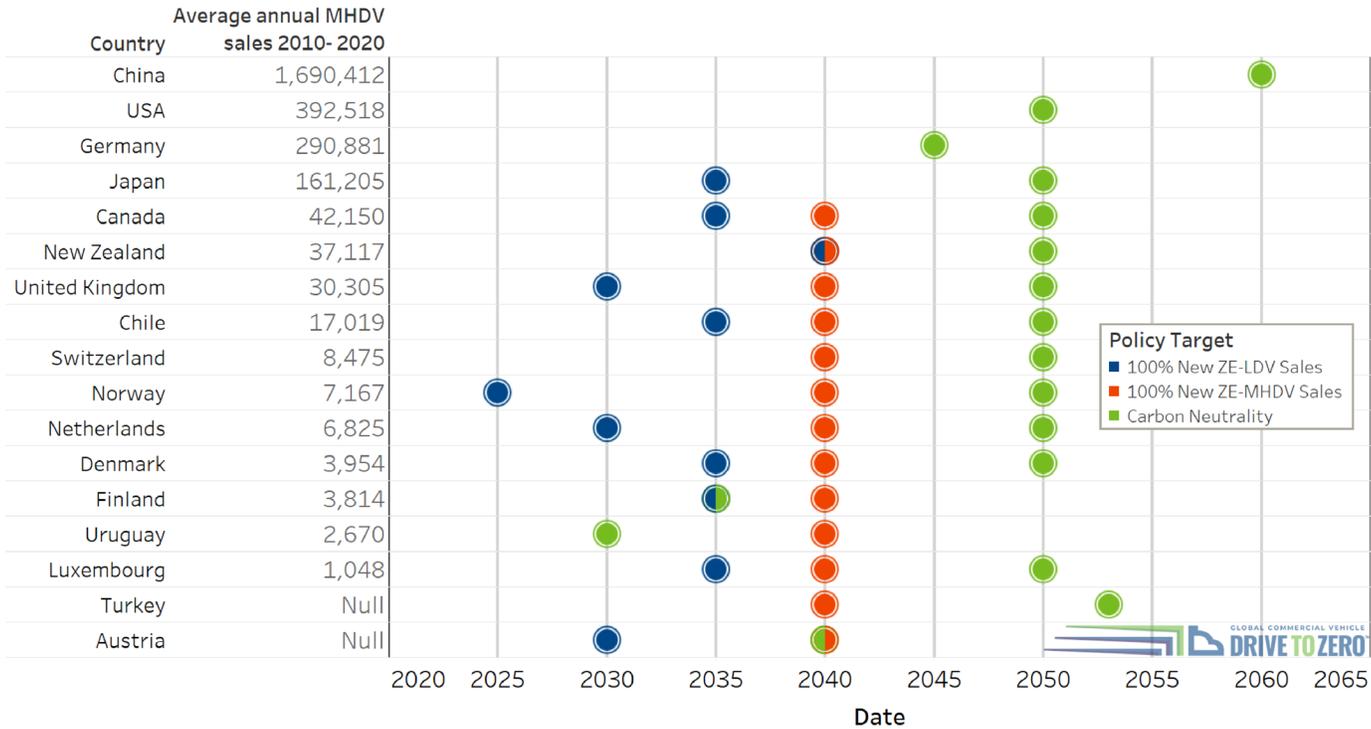
With the reasons for urgency outlined clearly, it is important to first establish where countries fall in terms of progress towards decarbonizing their transportation sector. Many countries have primarily set their focus on passenger vehicles and light-duty transportation, while a select few have taken greater initiative to also target MHDVs. Signaling this technology shift towards zero-emission technologies well in advance will allow fleet operators, manufacturers, utility providers, local authorities, and other stakeholders to prepare for the transition, including accelerating investments, advancing innovative financing mechanisms, and shifting supply chains. Even so, target-setting is only the first step in developing a supportive suite of policies that will encourage the major changes to take place in the industry. Establishing regulations, targeted and timebound incentive programs, and infrastructure investments are all integral for a zero-emission transportation future where limiting global temperature increases to 1.5°C remains within reach.

In a historic announcement at the 26th Conference of Parties (COP26) 15 leading nations pledged their support to a Global Memorandum of Understanding (MOU) that establishes zero-emission medium- and heavy-duty vehicle (ZE-MHDV) sales targets that will enable net-zero carbon emissions by 2050. The signatories of the MOU include a diverse array of national governments as well as partners from the private sector and NGOs. Austria, Canada, Chile, Denmark, Finland, Luxembourg, Netherlands, New Zealand, Norway, Scotland, Switzerland, Turkey, United Kingdom, Uruguay, and Wales have all pledged their support to the MOU and will work towards 30% ZE-MHDV sales by 2030, and 100% ZE-MHDV sales by 2040. This landmark agreement draws significant inspiration from California's first-of-its-kind Advanced Clean Truck Regulation (ACT) that similarly requires an increasing share of MHDV that are sold to be zero emission through 2035 (CARB, 2021).

The broad international support for this MOU marks an inflection point where the time for governments and other key stakeholders to dwell on the issue of technology readiness has passed. With numerous examples of successful deployments and operations, clean trucks and buses across all vocations are functionally ready to tackle a wide variety of duty cycles and ranges. Extreme ranges needed to meet the needs of long-haul applications, which present an increased challenge, are on track to arrive within the next few years and there is a level of optimism among manufacturers that even the heaviest of trucks will be electrified sooner than expected (CALSTART, 2021).

This briefing highlights the status of targets and ambitions set forth by leading nations to reduce the impact of transportation activity on the environment and public health. Building a supportive zero-emission vehicle (ZEV) policy ecosystem is critical to achieving accelerated action and more rapid adoption of innovative, clean technologies by fleets. Setting clear targets is the first step of the transition. The figure below outlines the high-level targets currently established by each country. Countries were selected to be included in this overview based on their MHDV fleet size, support of the Global MOU, and leadership in zero-emission transportation policy.

Figure 1. Countries’ policy targets for on-road vehicles



Note: Countries arranged in descending order by average annual MHDV sales from 2010 – 2020; Data unavailable for Turkey and Austria; LDV = light-duty vehicles; MHDV = Medium- and heavy-duty vehicles.

Figure 1 has employed three main indicators to assess the level of ambition a country has demonstrated: commitment to 100% sales of new zero-emission light-duty vehicles (blue dots) and medium- and heavy-duty vehicles (orange dots), and overall carbon neutrality goal established. Considering on-road transportation broadly, many nations have determined dates for 100% sales of new light-duty vehicles (LDVs) zero emissions, acknowledging their detrimental impact to the environment, air quality, and public health especially in dense urban settings (ICCT, 2021). This is a critical step forward and marks significant progress toward achieving zero-emission transportation, but it is still insufficient to meet the broader carbon neutrality goals. Recognizing the disproportionate impact that the heaviest vehicles have on transportation emissions is vital in grounding the urgency required to accelerate the deployment of zero-emission alternatives for freight and public transportation.

Figure 1 also highlights countries aiming for a full decarbonization of MHDVs through their commitment to the global MOU on ZE-MHDVs. Several other countries have introduced partial targets at the sub-national level or for certain vehicle segments which are significant in building out the necessary infrastructure and establishing best practices moving forward but circumvent the imperative to institute a national target for 100% new sales of MHDVs being zero emissions. Notably countries with the largest MHDV fleets—US, China, Japan, and Germany account for 67% of new MHDV sales globally

in 2019—have not yet made such commitments.¹ This reveals the need for continued government action to set ambitious targets for ZE-MHDVs, without which will hinder the achievement of carbon neutrality. Because the average lifespan of a truck is typically 10-15 years², countries should set targets for 100% ZE-MHDV sales at least 10 years before their carbon neutrality goals.

Zero-emission vehicle technologies inherently come with challenges and innovative solutions are needed to create a successful market. Strategically targeting buses and urban MHDVs that have more predictable duty cycles, benefit from regenerative braking, and return to base to be charged/refueled is an effective way to produce the greatest impact in early markets. This strategy can kickstart a greater shift, with infrastructure development also scaling up with investments toward these urban vehicles. Powertrain technology developed for these early segments—like batteries and motors—will continue to improve as investments flow into the market and these components can be transferred to other vehicle applications. The segmentation of vehicle platforms and the targeted deployment over time is commonly known as the Beachhead Strategy, drawing inspiration from the military term “beachhead,” where a strategic position is secured and used as a foothold to continue progress forward (CALSTART, 2020a). Regardless of these specific targets set forth for various parts of countries’ transportation sectors, more significant action must be taken at the countrywide level in alignment with national carbon neutrality goals and guidance established by global automotive manufacturers.

In addition to government commitments, MHDV manufacturers have also made their own commitments towards zero-emission vehicles (Table 2).

Table 2. OEM commitments to ZEV sales and carbon neutrality

OEM	COMMITMENT	DATE
Scania	At least 90% zero-emission vehicle sales worldwide, with remainder powered by 100% fossil-free energy	2040
GM Group	100% carbon neutral in global products and operations	2040
Stellantis	70% low-emission vehicle sales in Europe, and 40% in the US	2030
Ford Group	100% fossil free new vehicle sales	2040
Daimler Group	100% carbon neutral in driving operation in Europe, North America, and Japan	2039
Toyota Group	100% CO2 neutral in life cycle by 2050	2050
Changan Automobile Group	100% electric vehicle sales	2025

1 MarkLines data: see note on data at the end of the document
 2 Depending on the make, MHDVs can last even longer, particularly in secondary markets

OEM	COMMITMENT	DATE
Great Wall Motor Company Ltd. (GWM)	100% CO2 neutral, with interim target of 80% new energy vehicle sales by 2025	2045
Mahindra & Mahindra	100% carbon neutral in operations	2040
VW Group	100% CO2 neutral balance sheet	2050
Renault	100% CO2 neutral worldwide, with interim target of 100% CO2 neutral in Europe by 2040	2050
Nissan	100% carbon neutral across operations and product life cycle	2050
Mitsubishi	100% carbon neutral, with 50% EV sales by 2030	2050
Isuzu	100% CO2 neutral in vehicle operation and plants sheet	2050
Paccar	100% fossil free new vehicle sales	2040
Suzuki	90% reduction in CO2 emissions in driving operation	2050
Volvo Trucks Group	100% fossil free new vehicle sales	2040
CNH Industrial	100% fossil free new vehicle sales	2040
Honda	100% battery-electric and fuel cell electric vehicle sales in North America, with interim targets of 40% by 2030 and 80% by 2035	2040
Mazda	90% reduction in CO2 emissions in driving operation and energy production	2050
Hyundai Kia Automotive Group	100% CO2 neutral in all operations	2050

Research included all OEMs with >100,000 sales in 2020 and publicly available commitments to 70%-100% ZEV sales or carbon neutrality. Based on publicly available information as of July 15th, 2021.

The manufacturers listed above together represent a 45% global market share and thus the actions taken and established by these corporations are very influential in moving the market. However, “fossil free” and “carbon/CO2 neutral” commitments are not the same as “zero emissions” and could still rely on internal combustion engines (ICEs) powered by fossil-free or carbon/CO2 neutral energy sources. These engines would still have tailpipe emissions contributing to local air pollution, which disproportionately impacts frontline communities who live closer to major highways and freight facilities, and rely more on public transportation. In addition, the supply of truly sustainable biofuels – those made from waste sources and that do not generate indirect land use change emissions or compete for land and food production – is very limited and should thus be allocated to harder-to-abate sectors such as marine shipping and aviation (ICCT, 2021a). Electrofuels³, liquid or gaseous fuels that can be used directly in current ICEs and that are made by producing hydrogen from electrolysis, will also be in very limited supply and will only achieve cost parity with fossil fuels by 2050 in the best-case scenario (ICCT, 2021b). While manufacturer commitments to MHDV decarbonization should be applauded, stronger commitments to zero-emission engines—those with zero tailpipe emissions—are still needed.

³ Also known as power-to-liquids, power-to-gas, e-fuels, and e-gas.

The dynamics between government and the private sector commitments is self-reinforcing. The most action and progress will happen when all stakeholders work together in a coordinated fashion to move the market towards a shared vision of a zero-emission transportation future. The action taken by manufacturers is encouraging and indicates a fundamental shift in technology and transportation. The government ambition established at COP26 is a historic achievement and sets the example for where other countries need to be. To ensure action happens in an efficient and accelerated manner that leverages the advancements in technology, policy, and infrastructure development, all countries must establish targets for 100% ZE-MHDV sales by 2040.

To keep global temperatures from rising by 1.5°C above pre-industrial levels, the transportation sector must be the target of direct action taken at the highest level. The Global MOU takes aim at a sector where emissions reductions have historically been challenging. Already with the backing of 15 countries, the international agreement will serve to accelerate the market for clean trucks and buses across the world that in turn will drive down GHG emissions and significantly reduce air pollution especially in cities and urban areas. The MOU not only establishes fresh ambition, but also serves to facilitate the exchange of knowledge and best practices among signatories. Establishing targets is a critical first step toward impactful action and achieving the necessary volumes of ZE-MHDVs needed to ensure the emissions of the transportation sector do not contribute disproportionately to the warming of the planet.

NOTE ON DATA AVAILABILITY

The vehicle sales data in this report was retrieved from MarkLines, a global automotive data provider. The MHDV counts for each country were determined based on MarkLine's classification system. The following categories were included in the counts of MHDV sales: Buses, commercial vehicles, Extra Heavy Trucks, Heavy trucks, Heavy Trucks (Chassis), Heavy Trucks/Buses, Large Buses, Large Buses (Chassis), MCV/HCV, Medium Buses, Medium Buses (Chassis), Medium trucks, Medium Trucks (Chassis), Medium/Heavy Trucks, Minibus, Panel Van, Prime mover, Semi Trailer, Small Buses, Small Buses (Chassis), Tractors, Trucks, Trucks/Buses.

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