

A Zero-Emission Medium- and Heavy-Duty Vehicle Sales Standard for Canada

The key policy to decarbonize trucks and buses

by Sarah McBain, Chandan Bhardwaj and Adam Thorn | November 2023

This summary highlights the findings from our report, *Canada's Pathway to Net-Zero for Medium- and Heavy-Duty Trucks and Buses: Part 1: Zero-Emission Vehicles*.

Canada's transportation sector is the source of approximately one-quarter of the country's total greenhouse gas (GHG) emissions. As a transportation sub-sector, medium- and heavy-duty vehicles (MHDVs), essential to the national economy, account for over 37% of vehicle-related GHGs and are expected to surpass passenger car emissions by 2030. Recognizing this sector's emissions trajectory, the Government of Canada included ambitious sales targets for automakers in its 2030 Emissions Reduction Plan (ERP): By 2030, 35% of new MHDV sales must be zero emission (ZE) vehicles, and 100% of MHDV sales should be ZE by 2040 (based on feasibility).

The Pembina Institute analyzed multiple policy pathways to determine which one would be most effective in supporting sufficient production and purchases of ZE MHDVs to meet the ERP sales targets. These pathways included analysis of purchase subsidies for ZE MHDVs and analysis of a ZE MHDVs sales standard. We considered different policy scenarios, varying levels of subsidies, and sales target options for a ZE MHDV sales standard. Our baseline scenario factored in existing federal and provincial policies (e.g., the carbon tax, the Clean Fuel Regulations, and the vehicle emission standard). After close study of the merits and drawbacks of each policy option, we determined that the transition to ZE MHDVs can be achieved most effectively through a ZE MHDV sales standard. (A detailed description of our analytical methodology is available in the Technical Appendix).

It is worth noting that a stringent vehicle emissions standard could be drafted to achieve outcomes similar to those of a ZE MHDV sales standard. But the level of required reductions would need to rise to levels that are triple those cited in Canada's current requirements, a highly unlikely scenario and therefore a significant drawback to this approach. Anything less than tripling the reduction levels would fail to have the same impact as a sales standard.

The direct and ancillary benefits of a sales standard

Modelling by the Pembina Institute shows that implementing a sales standard for MHDVs is the most effective means of reaching sales targets for new ZE MHDVs where 35% of new MHDVs sold are zero-emission vehicles by 2030 and 100% are zero-emission by 2040. From our analysis, we can conclude that a sales standard will be key to achieving the following:

1. **Sales of new ZE MHDVs will either meet or come close to meeting sales goals of 35% by 2030 and 100% by 2040.** Other policies, such as the carbon price and the Clean Fuel Regulations, encourage switching from fossil fuel MHDVs to ones that are zero emission. But our analysis shows that the results will fall short of Canada's climate goals under the current policy regime. Absent a sales standard, ZE MHDVs will make up only 8% of new MHDV sales in 2030 and 35% of new MHDVs sales in 2040.
2. **GHG emissions from the MHDV sector would drop by as much as 80% by 2050 relative to business-as-usual should the sales standard incorporate our recommended targets.** According to our analysis, MHDV emissions would decline from 35 Mt in 2020 to 10 Mt or less in 2050. Essentially, fossil fuels will be replaced by clean electricity and hydrogen.
3. **Energy consumption will be reduced by more than 25% from 500 PJ in 2015 to 400 PJ in 2050.** On average, ZE MHDVs are far more energy efficient than are diesel-powered vehicles. While putting more ZE MHDVs on the road increases the electricity consumption of MHDVs, total energy consumption, which includes gasoline, diesel fuel, and, to a lesser extent, other power sources, in the MHDV sector decreases due to greater efficiencies in how energy is used. An important added benefit is the enhanced energy security when less reliant on external sources of energy and less exposed to price volatility in the oil and gas market.
4. **Investments in ZEV-related R&D and supply chains will accelerate,** which will help drive innovation and economies of scale. We can also anticipate that the high costs associated with early advances in technology will steadily decline.
5. **Positive health outcomes will result with the decline in air pollution caused by diesel exhaust,** which has been linked to incidences of asthma, cancer and respiratory diseases. According to a 2022 Health Canada report, traffic-related air pollution contributed to 1,200 deaths in Canada in 2015; 63% of those deaths were attributed to exhaust from MHDVs.

Designing an effective ZE MHDV sales standard

The Pembina Institute has developed a national strategy, ZeroX2040, which provides guidance on how Canada can gradually turn over its fossil-fuelled MHDVs to electric and hydrogen-

fuelled ones by 2040. Our strategy and proposed sales standard takes the “beachhead” approach developed by U.S.-based CALSTART and the California Air Resources Board and adapts it to the Canadian context. In the ZeroX2040 strategy, ZE MHDVs are introduced in waves so that vehicles that are ready at scale to transition to ZE are subject to the most ambitious targets first. Subsequent waves of ZE MHDV deployment would affect heavy-duty trucks that, currently, are less technologically mature and require a longer ramp-up period before they are market-ready.

For example, ZE buses, especially transit and school buses, are now commercially available. Many ZE bus models are on the market and, due to relatively short and predictable routes and access to overnight charging, lend themselves to a fairly smooth transition. Lighter, medium-duty vehicles (MDVs) such as urban delivery vans are likewise market-ready at scale. However, market-ready — or near-market ready — long-haul trucks and other HDVs are scarce. HDVs travel long distances, and therefore need access to very fast recharging/refuelling options, which are still in short supply.

By accelerating the deployment of ZE buses and MDVs in the first wave, the technological advances made during that initial stage can be applied to decarbonizing efforts for HDVs.

Using the realities of the marketplace and the current technological status of different classes of MHDVs as our framework, the Pembina Institute proposes a ZE MHDV sales standard (Figure 1) where:

- Most buses reach 100% ZEV sales by 2030
- Most urban MDVs reach 50% ZEV sales by 2030 and near 100% by 2040
- HDVs reach up to 10% ZEV sales by 2032 and near 100% by 2045

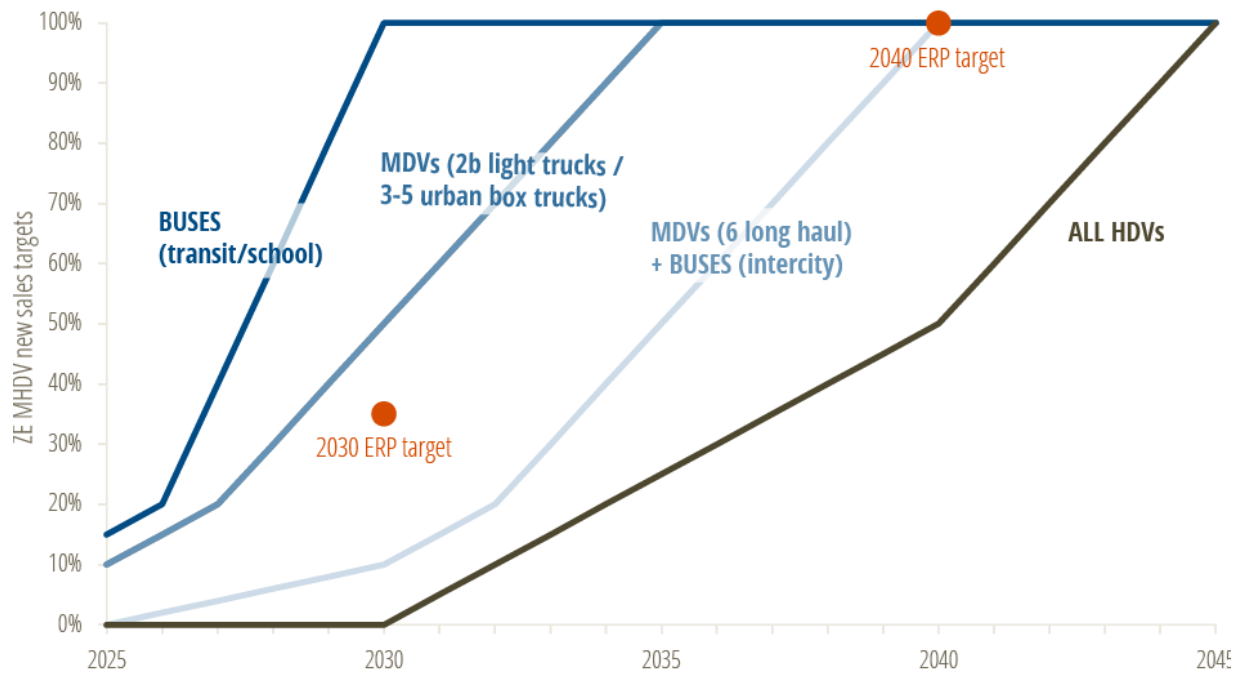


Figure 1. Recommended ZE MHDV new sales targets across different MHDV classes

Conclusion

To a) achieve a smooth transition in the MHDV sector from fossil-fuel-burning vehicles to non-emitting ones, and b) reach the sales targets set out in the Emissions Reduction Plan, Canada will need to enact a strong ZE MHDV sales standard. Current climate policies applicable to the transportation sector — e.g., the Clean Fuel Regulations and the carbon price — help advance the switch away from diesel power. But these policies alone will not accelerate the deployment of ZE MHDVs quickly enough to meet overall climate goals for Canada.

Moreover, the federal government will need to address the equally pressing need for charging and refuelling infrastructure to complement policies designed to increase ZE MHDV production and uptake. It will be through these parallel pathways that Canada will build a direct route to realizing a low-carbon MHDV sector.

See also our companion report on ZEV Infrastructure needs, *Canada's Pathway to Net-Zero for Medium- and Heavy-Duty Trucks and Buses: Part 2: Charging and Refuelling Infrastructure*.