Decarbonizing Medium- AND Heavy-Duty Vehicles

Towards Clean MHDVs

Exploring the challenges and potential policy solutions

Adam Thorn, Transportation Director
Pembina Institute
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Leading Canada’s transition to clean energy

The Pembina Institute is a non-profit think-tank that advocates for strong, effective policies to support Canada's clean energy transition.

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Canada's Climate Commitments:

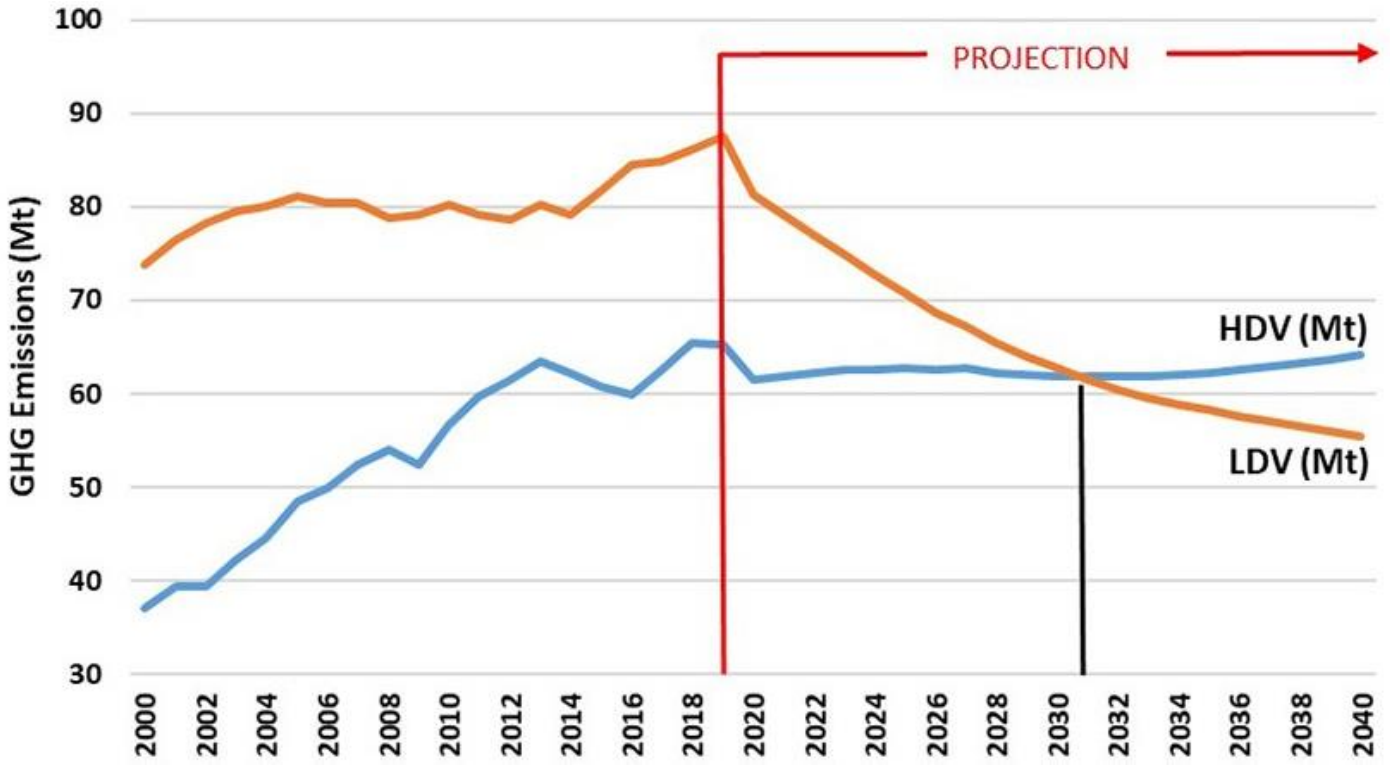
Reduce GHG emissions by 40-45% below 2005 levels by 2030 and net-zero by 2050.

Emission Reduction Plan 2030: Key MHDV goals

- Launch an integrated strategy to reach 35% of total MHDV sales being zero-emission by 2030.
- Develop a regulation to require 100% MHDV sales to be zero-emission by 2040, where feasible.
- Stringent heavy-duty vehicle and engine standards post 2025.
- Investment in vehicle retrofits, a MHDV purchase incentive program, and hydrogen demonstration projects.

LDV and HDV GHG emissions

(real and projected)



Data source: Environment and Climate Change Canada's Discussion paperr on HDVs in Dec 2021

A Strategy for Canada

- Working with relevant stakeholders to develop context-sensitive recommendations to help Canada meet its goals
- Takes a “beachhead” approach when it comes to implementing a ZE MHDV sales standard

Medium-duty
- Pick-up trucks
- Delivery vans
- Box/delivery trucks

Heavy-duty
- Short-haul tractor trailers
- Long-haul tractor trailers
- Heavy rigid trucks

Passenger Buses
- School
- Transit
- Intercity

What are we trying to achieve?

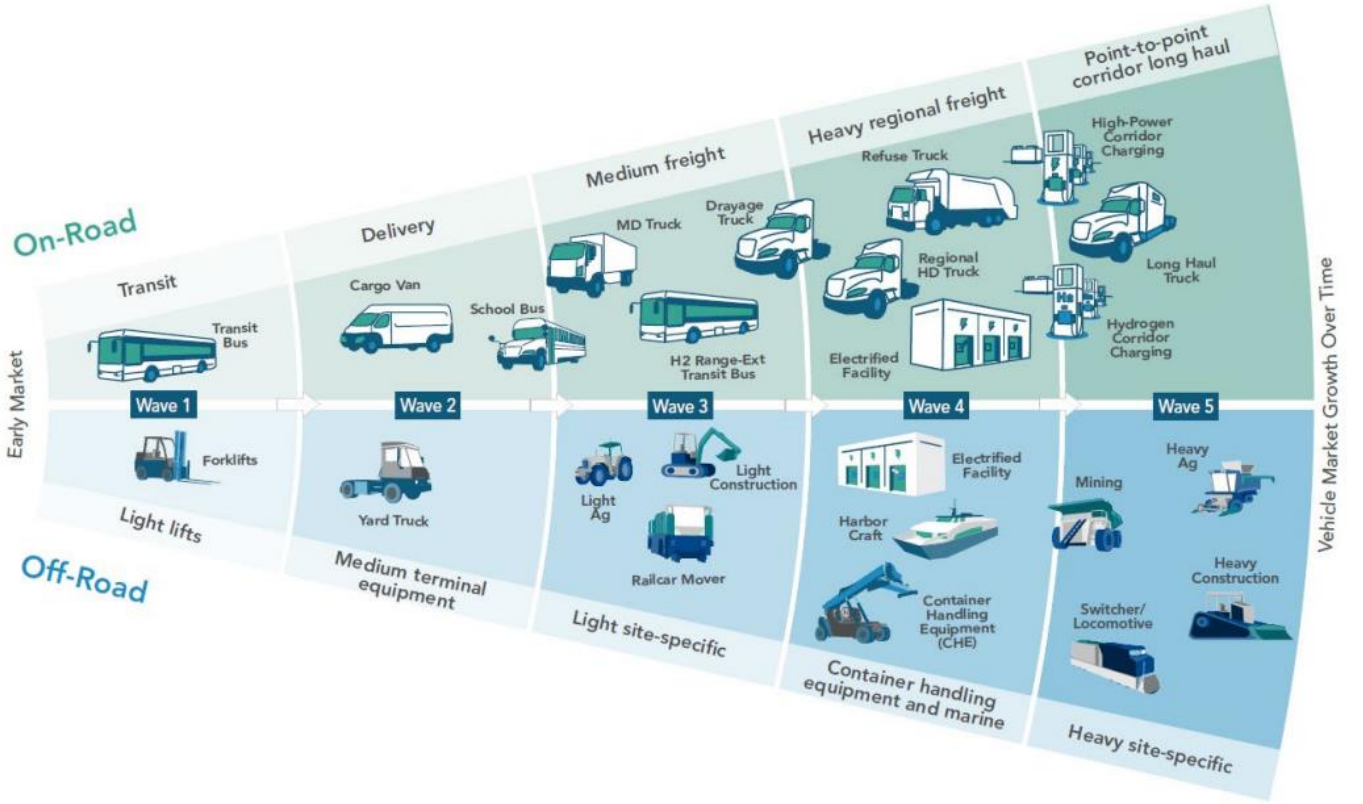
Public policy objectives such as:

1. Deep emission reductions
2. Accelerated deployment of ZEVs
3. Market certainty
4. Protection of public health and well-being
5. Economic growth and innovation

Methodology

1. Jurisdictional scan and literature review
2. Energy-economy modeling
3. Stakeholder engagement
4. Strategy development

A global ZE MHDV beachhead strategy



Market Progress Over Time

Similar drivetrain and component sizing can scale to early near applications

Expanded supply chain capabilities and price reductions enable additional applications

Steadily increasing volumes and infrastructure strengthen business case and performance confidence

Source: CALSTART, *The Beachhead Strategy* (2022)

Measures for decarbonization

Policies and regulations

- Zero-emission vehicle mandate
- Vehicle emissions standard
- Taxes on internal combustion vehicles
- Procurement mandates

Incentives and subsidies

- Zero-emission vehicle purchase subsidies
- Concessional lending
- On-bill financing
- Manufacturing subsidies and tax credits

Capacity building

- Workforce training
- Awareness and education programs
- Cross-jurisdictional collaboration

Charging and fueling infrastructure

- Charging and refueling infrastructure subsidies
- Interoperable charging standards
- Clean electricity standards

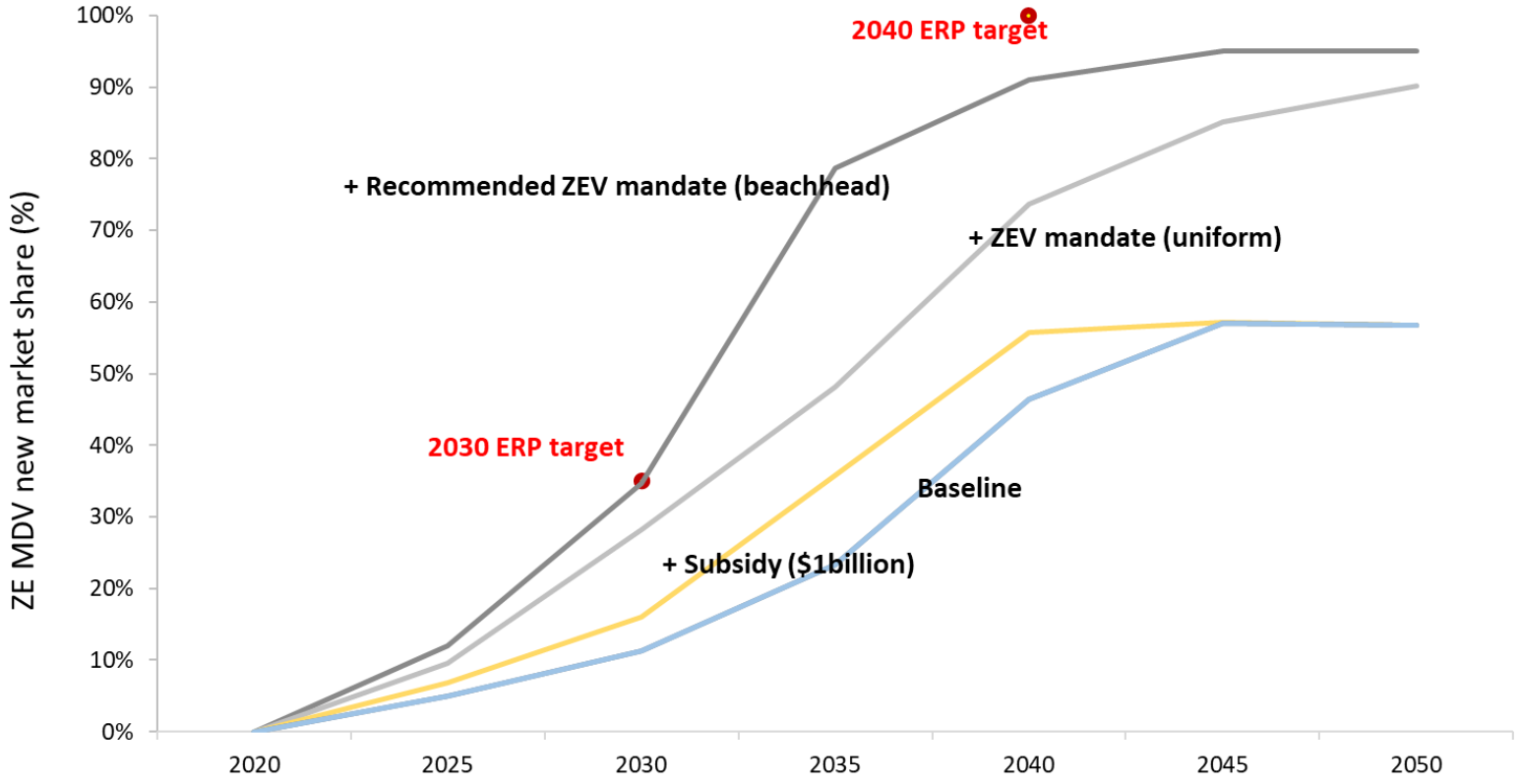
Early Insights

- ZEV Sales Standard
- Infrastructure Needs

A ZEV Sales Standard

- Current policies in place in Canada are not nearly strong enough to meet Canada's 2030 and 2040 ZE MHDV sales targets
- Supplementing current policies in Canada with further purchase subsidies does not achieve Canada's sales targets
- **Only a ZEV sales standard comes close to meeting these sales goals**

A ZEV standard: best bet to achieve new sales goals



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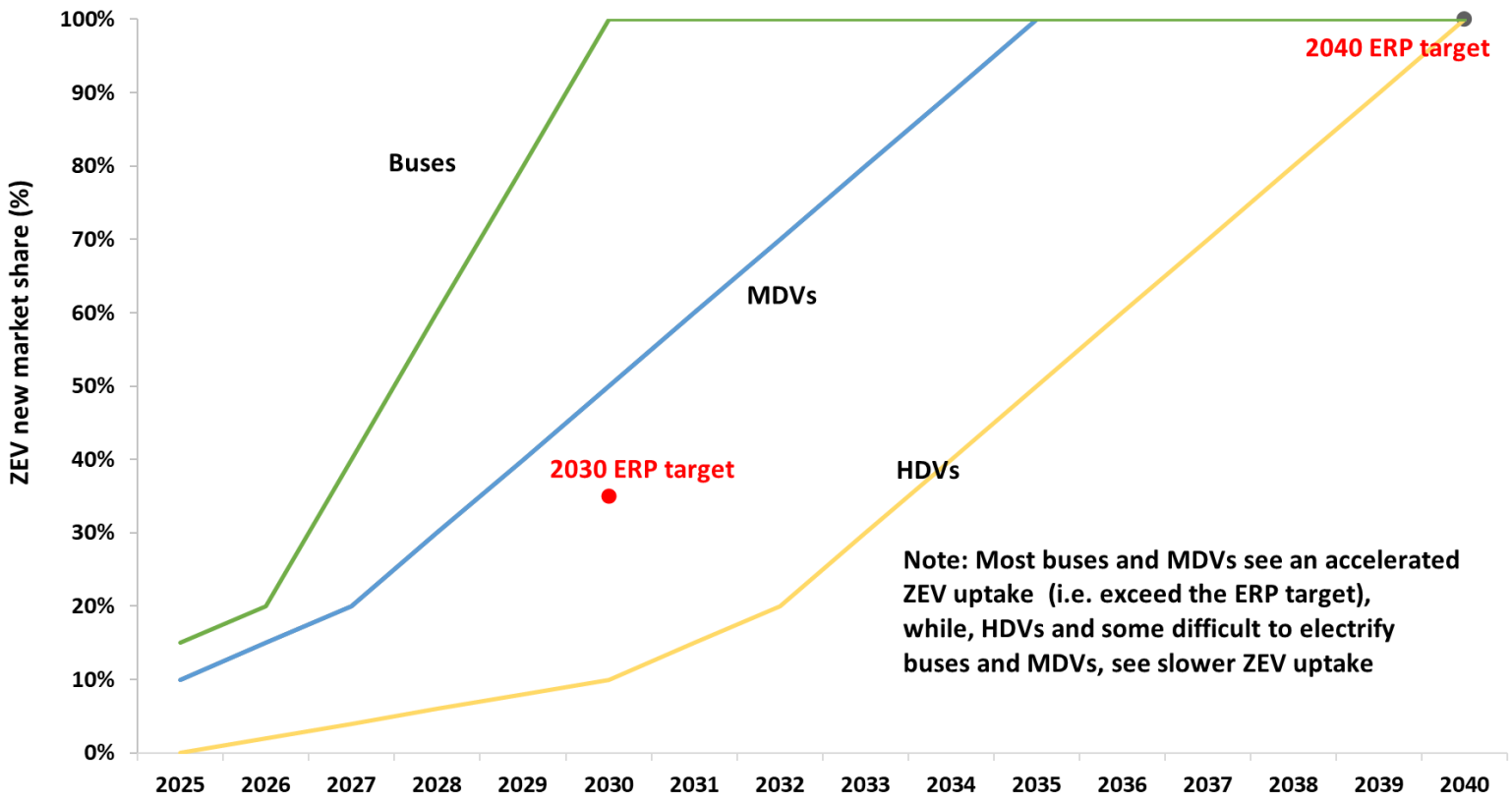
Recommended ZEV Sales Standard Design

Year	Buses	MDVs (2b light trucks)	MDVs (3-5 urban box trucks)	MDVs (6 long-haul trucks)	MDVs (4-6 non-box trucks)	HDVs
2025	15%	10%	10%	0%	0%	0%
2030	100%	50%	50%	10%	10%	10%
2035	100%	100%	100%	50%	50%	50%
2040	100%	100%	100%	100%	100%	100%

Recommended ZEV sales standard design



Why a sales standard?

- Achieves (or comes close to achieving) ZEV sales goals for 2030 (35%) and 2040 (near 100%)
- Achieve substantial GHG reductions by 2050: all sales standard scenarios resulted in average of 90% reduction of emissions below the 2005 levels (50MT), reaching 5MT by 2050.
- Reduces energy consumption more than other scenarios, thus contributing to more to energy security
- Induces larger and fasters declines in technology costs
- Reduces compliance risks as ZEVs do not suffer from long-term uncertainty in availability and economic feasibility

Complementary policy measures

Policies and regulations	• Existing policies including carbon pricing, vehicle emissions standards and clean fuel standards should continue to rise in stringency
Incentives and subsidies	• Purchase incentives remain a short-term measure that decreases over time • Subsides should be made more accessible to small businesses and operators to improve equitable distribution
Capacity building	• Facilitate new skills training programs, including those in ZEV maintenance and repair • Provide enhanced support for demonstration and early commercial implementation projects • Improve funding for education and awareness initiatives

Charging & refueling infrastructure needs

- We estimate a dramatic increase in the number of level 2 and 3 EV chargers required by 2040:
  - private depots (15000 in 2025 to 300,000),
  - public chargers (30,000)
  - hydrogen fueling stations (5,000)
- Charging station investments needed total $7-13 billion by 2050, and approximately 9 billion for hydrogen fueling stations
- This is at least a 10-fold jump from the ~1.5 billion committed by the government (including $680 million under ZEVIP and $600 million by CIB)

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We are looking for your feedback!

Sign up to receive our draft recommendations

http://www.pembina.org/Decarbonizing-MHDVs

Adam Thorn: adamt@pembina.org

www.pembina.org

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