POLICY UPDATE

SEPTEMBER 2018

PROPOSED SECOND-PHASE GREENHOUSE GAS EMISSIONS STANDARDS FOR HEAVY-DUTY ENGINES AND VEHICLES IN CANADA

ICCT **POLICY UPDATES** SUMMARIZE REGULATORY AND OTHER DEVELOPMENTS RELATED TO CLEAN TRANSPORTATION WORLDWIDE.

On May 30, 2018, Canada published final standards to reduce greenhouse gas (GHG) emissions from new on-road heavy-duty vehicles[1]. The new regulation is part of Canada's economy-wide commitment to reduce GHG emissions 30% by 2030 compared to a 2005 baseline. This new round of requirements applies to model year (MY) 2021 through 2027 trucks and buses and MY 2020 through 2027 commercial trailers. The preceding Phase 1 regulation, finalized in 2013, affected commercial vehicles MY 2014 through 2017. Environment and Climate Change Canada's (ECCC) Phase 2 regulation closely aligns with the U.S. national standards, which were finalized in October 2016 by the U.S. Environmental Protection Agency (U.S. EPA) and the U.S. Department of Transportation's National Highway Traffic Safety Administration.[2]

The regulatory design of the Phase 2 regulation mirrors the U.S. program and contains four separate standards linked to specific provisions for (a) tractor trucks, (b) vocational vehicles, (c) heavy-duty pickup trucks and vans, and (d) commercial trailers—a newly added equipment category in both the final Phase 2 standards in the U.S. and Canada.[3] In addition, as in Phase 1, there are separate dynamometer-based standards for the engines that power tractor trucks and vocational vehicles. Additional details regarding the Phase 2 regulation can be found in our policy update summarizing the U.S. national program[4].

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1 Regulations Amending the Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations and Other Regulations Made Under the Canadian Environmental Protection Act, 1999: SOR/2018-98. Vol. 152, No. 11. Ottawa, ON, Canada Gazette, Part II (May 16, 2018). http://gazette.gc.ca/rp-pr/p2/2018/2018-05-30/html/sor-dors98-eng.html

2 Under the authority of the Canada Clean Air Act, Environment and Climate Change has the ability to regulate greenhouse gas emissions. As such, ECCC's standards are technically aligned with the U.S. EPA's regulation, as opposed to NHTSA, which has authority to set fuel consumption limits.

3 On October 27, 2017 a U.S. federal appeals court issued an order temporarily halting the implementation of the trailer standards, which were initially set to go into effect on January 1, 2018.

4 Ben Sharpe, Nic Lutsey, Oscar Delgado, and Rachel Muncrief, *Policy update: United States efficiency and greenhouse gas emission regulations for model year 2018-2027 heavy-duty vehicles, engines, and trailers* (ICCT: Washington, DC, 2016), https://www.theicct.org/publications/us-efficiency-and-greenhouse-gas-emission-regulations-model-year-2018-2027-heavy-duty

The stringency levels of the standards vary according to vehicle categories which are based on weight classes and vehicle attributes. The estimated per-vehicle percent reductions in MY 2027 versus the MY 2017 baseline and the associated incremental vehicle costs are shown in Table 1.[5]

Table 1: Summary of GHG reductions and the estimated incremental purchase and maintenance costs (2016 Canadian dollars [CAD]) in MY 2027 for each vehicle category6

Regulatory category	GHG reduction in MY 2027 versus MY 2017 baseline*	Incremental cost of MY 2027 vehicles versus MY 2017 baseline
Tractor trucks	15% to 27%	$14,249
Vocational vehicles	10% to 24%	$3,058
Heavy-duty pickup trucks and vans	16%	$1,960
Commercial trailers	5% to 9%	$1,183

* The percentage reduction values are based on the U.S. rule and are *not* explicitly stated in the ECCC regulations. The ECCC regulatory limit values for tractors, vocational vehicles, and trailers are in terms of grams CO2 per short ton-mile (short ton = 2,000 lbs. = 907.2 kg). For heavy-duty pickups and vans, the limit values are in terms of grams CO2 per mile.

Tractor trucks, which represent the largest share of fuel use and GHG emissions, have required GHG reductions between 15% and 27% depending on gross vehicle weight (GVW), roof height, and cabin configuration (i.e., day cab or sleeper cab). The projected technology packages required to achieve these GHG reductions will result in additional costs of roughly $11,300 CAD[7] per tractor, on average. For vocational vehicles, GHG reductions in MY 2027 range from 10% to 24% and are estimated to increase vehicle costs by an average of $4,400. Class 2B and 3 pickup trucks and vans are expected to achieve annual GHG reductions of 2.5%, which results in total savings of 16% by MY 2027. The forecasted technologies needed to reach these efficiency levels by 2027 will represent an added expense of approximately $1,300 for pickup trucks and vans. Finally, in harmonization with the U.S. regulations, ECCC has proposed to add commercial trailers as a new regulatory category. The CO_2 reductions associated with trailers between MY 2020 and 2027 range from 5% to 9% depending on the type of trailer, and the technologies needed to achieve these improvements—primarily aerodynamic and tire-related technologies—will increase the cost of the average trailer by approximately $1,200.

Over the lifetime of the MY 2020 to 2029 vehicles affected by these regulations, ECCC estimates a total GHG emissions reduction of 73 million CO_2-equivalent tonnes. For reference, the estimated GHG reductions of ECCC's Phase 1 regulation was 19.1 million tonnes. The total monetized value of the fuel savings, GHG reductions, and other environmental and economic benefits of the proposed regulation are estimated

5 Although the U.S. and Canadian standards are aligned in terms of carbon dioxide (CO_2) limit values, all of the per-vehicle percentage reduction values cited in this policy update are based on the U.S. rule and are *not* explicitly stated in the proposed ECCC regulation.

6 In addition to the vehicle and trailer categories shown here, engines of tractor trucks and vocational vehicles are required to reduce GHGs by up to 5% versus the 2017 baseline. The additional costs associated with engine improvements are included in the dollar amounts shown for tractors trucks and vocational vehicles in the right column.

7 All dollar amounts in this policy update are in 2016 Canadian dollars.

to be $23.8 billion CAD. The additional capital and operational costs associated with the development and deployment of efficiency technologies required to meet the standards is estimated to be $6.0 billion CAD. The nearly $18 billion CAD in net benefits for the Phase 2 proposal exceeds the net benefits of the Phase 1 regulation by roughly a factor of 4.

CANADA-SPECIFIC PROVISIONS

Though the Canada and U.S. programs are aligned in all key areas, there are some important Canada-specific elements of the regulations.

Averaging, banking, and trading. The regulations allow manufacturers and importers of heavy-duty vehicles and engines to meet the standards based on sales and averaging in the Canadian market by participating in a CO_2 emission credit system. Canada-specific compliance and reporting allows for far more accurate accounting of how new vehicle performance standards translate into real-world emission benefits. A Canada-specific averaging, banking, and trading (ABT) program does not necessarily provide greater GHG reductions than a program without ABT provisions. To minimize the administrative burden on manufacturers and importers, ECCC has developed streamlined reporting procedures that are coordinated with the U.S. EPA. However, manufacturers are not allowed to move credits (or deficits) between the U.S. EPA and ECCC regulations.

An important exception to these ABT provisions applies to manufacturers and importers of engines certified by the U.S. EPA. Specifically, they are not required to demonstrate compliance based on Canada-specific sales if they meet certain sale thresholds, which depend on a ratio of the number of engines sold in Canada and in the United States.

Concurrent sales. As in the Phase 1 regulation, the Phase 2 regulation allows engines that are certified by the U.S. EPA to be sold concurrently in Canada without demonstrating compliance based on Canada sales-weighted averaging. This provision is designed to reduce the compliance burden on industry and allows engine manufacturers and importers to sell a certain number of higher-emitting engines without impacting their Canada-specific sales-weighted average. However, a key stipulation to protect against the potential for gaming is that the higher-emitting engines must be sold in greater quantities in the U.S. than in Canada. An engine model certified at CO_2 levels higher than the standard must participate in the emissions-accounting system based on sales-weighted averaging if sales of that model in Canada are (a) more than 1,000 and exceed the number of engines of the same engine family that are sold in the U.S. or (b) between 101 and 1,000 and are more than twice the number of engines sold in the United States. For context, the U.S. heavy-duty sales market is roughly 10 times greater than that of Canada. This provision prevents the development of high-emitting niche engines for the Canada market.

Additional flexibility provisions. To minimize the regulatory burden on industry, ECCC has proposed a number of additional flexibility provisions, including:

» Exemption for manufacturers or importers that sell less than 200 combined tractors and vocational vehicles in Canada in a given model year;

- Additional exemptions from CO_2 limits and reporting requirements for the engines sold in the exempted tractors and vocational vehicles;
- One-year temporary exemption for small volume manufacturers or importers that sell less than 100 trailers in Canada in 2020; and
- Transitional flexibility for all manufacturers or importers of MY 2018 to 2026 trailers, who can choose to exempt 20% of their trailers sold from the regulation. This 20% value is capped at less than 25 for box trailers and less than 20 for non-box trailers.

ECCC's analysis indicates that these additional flexibilities will not significantly affect the final positive outcome of the regulations. Per the regulatory flexibility analysis (ECCC, 2017):

> *Relative to the initial option, the flexible option [for all engine and vehicle categories] is expected to result in a slight decrease in GHG emission reductions, as well as a loss of information related to emission performance for some heavy-duty engines and trailers in end of model year reports submitted to the Department. However, any additional risk introduced by the flexible option is anticipated to be low and manageable.*

Mandatory standards for tractors great than or equal to 120,000 pounds gross combined vehicle weight (GCVW). Whereas the large majority of tractor-trailers in the United States have a GCVW of 80,000 lbs. or less, Canada has a much larger percentage of tractor-trailers carrying heavier payloads. As such, ECCC has finalized additional requirements for tractor trucks that are designed for very heavy loads.

Although the U.S. regulation has optional standards for tractors rated for 120,000 lbs. GCVW or more, ECCC has mandatory CO_2 limits for two categories of heavy tractors:

- Heavy line haul tractors: 120,000 lbs. ≤ GCVW < 140,000 lbs.
- Heavy-haul tractors: ≥ 140,000 lbs. GCVW

The CO_2 limit values for heavy line haul and heavy-haul tractors in the ECCC regulation are shown in Table 2. For tractors less than 120,000 lbs., the ECCC standards are identical to the U.S. regulation in terms of limit values and assumed technology penetration. For heavy line haul tractors (i.e., tractors between 120,000 and 140,000 lbs.), there are six regulatory subcategories based on roof height and cab type. Because heavy line haul tractors are used in similar ways as tractors less than 120,000 lbs., the same set of technologies are assumed to provide cost-effective benefits in this segment. However, for certain technologies such as aerodynamics, low rolling resistance tires, and 6x2 axles, ECCC has assumed less aggressive market penetration for setting the CO_2 limit values. For the heaviest group of tractors larger than 140,000 lbs., ECCC has mandatory limits of 52.4, 50.2, and 48.3 grams CO_2 per ton-mile in 2021, 2024, and 2027, respectively.

Table 2: Summary of tractor regulatory subcategories and CO_2 limit values in the U.S. and Canada

Class	Type	GVW	Baseline MY 2017	US final rule MY 2027		Canada proposal MY 2027	
			g CO_2 / ton-mile	g CO_2 / ton-mile	Percent change 2017–2027	g CO_2 / ton-mile	Percent change 2017–2027
Class 7 tractor	Low roof	Up to 120,000 lbs.	119.1	96.2	–19%	Same limits as in the U.S. final rule	
	Mid roof		127.2	103.4	–19%		
	High roof		129.7	100.0	–23%		
Class 8 tractor (day)	Low roof		91.3	73.4	–20%		
	Mid roof		96.6	78.0	–19%		
	High roof		98.2	75.7	–23%		
Class 8 tractor (sleeper)	Low roof		84.0	64.1	–24%		
	Mid roof		90.2	69.6	–23%		
	High roof		87.8	64.3	–27%		
Class 8 heavy line haul tractor (day)*	Low roof	120,000 to 140,000 lbs.	Baseline values not provided in the ECCC rule or Regulatory Impact Analysis Stament	In the U.S. final rule, tractors over 120,000 lbs. GVW can meet the optional heavy haul standard shown below.		48.9	Unknown
	Mid roof					50.8	
	High roof					48.6	
Class 8 heavy line haul tractor (sleeper)*	Low roof					42.4	
	Mid roof					44.7	
	High roof					41.0	
Heavy haul tractor		140,000 lbs. and greater	57	48.3 (optional)	–15%	48.3	–15%

* In the ECCC regulation, tractor trucks between 120,000 and 140,000 GVW are called “heavy line haul.” These six regulatory subcategories are unique to ECCC’s rulemaking.