POLICY UPDATE

MAY 2013

GREENHOUSE GAS EMISSIONS STANDARDS FOR MEDIUM- AND HEAVY-DUTY ENGINES AND VEHICLES IN CANADA

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

On March 13, 2013, Canada published its finalized standards to reduce greenhouse gas (GHG) emissions from new on-road heavy-duty vehicles. The Environment Canada (EC) regulations are designed to align with the U.S. national standards, which were finalized in September 2011 by the U.S. Environmental Protection Agency (EPA) and the Department of Transportation's National Highway Traffic Safety Administration (NHTSA). The official regulations are published in the *Canada Gazette*, Part II (Environment Canada (EC) 2013).

As with the U.S. program, the national standards for Canada affect model year (MY) 2014 to 2018 vehicles and require CO_2 emission reductions ranging from 6% to 23%[1] in the MY 2017 timeframe as compared to a MY 2010 baseline. The stringency levels vary based on vehicle subcategories that are based on weight classes and vehicle attributes. Over the lifetime of the vehicles affected by these regulations, Environment Canada estimates that the total GHG emissions reduction will be 19.1 million tonnes.

The regulatory design mirrors the EPA program, and the rule is best understood as three separate standards linked to specific provisions for tractor trucks, heavy-duty pickup trucks and vans, and vocational vehicles as well as separate standards for the engines that power tractor trucks and vocational vehicles. The individual components of the regulations are summarized in Table 1 and the text below. For reference, a more thorough summary of the elements of the regulations can be found in an ICCT policy update summarizing the U.S. national program (The International Council on Clean Transportation (ICCT) 2011).

Though the Canada and U.S. programs are aligned in all key areas, there are some important Canada-specific elements of the regulations, which are summarized in the final section of this policy update.

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1 While the U.S. and Canada standards are the same, 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 Environment Canada regulations.

Table 1: Summary of key elements of the regulations

Regulatory Category	Regulatory Subcategories	Compliance Assessment	Stringency[1] versus Model Year 2010 Baseline
Tractor trucks	Nine subcategories based on weight, cab configuration, and roof height	GEM simulation Inputs: aerodynamics, tire rolling resistance, weight reduction, idle reduction, vehicle speed limiter	9% to 23%
Heavy-duty pickup trucks and vans	• Diesel • Gasoline	Chassis dynamometer testing	12% for gasoline 17% for diesel
Vocational vehicles	• Light heavy-duty (Classes 2B-5) • Medium heavy-duty (Classes 6 and 7) • Heavy heavy-duty (Class 8)	GEM simulation Inputs: tire rolling resistance	6% to 9%
Engines for tractors and vocational vehicles	• Light heavy-duty (Classes 2B-5) • Medium heavy-duty (Classes 6 and 7) • Heavy heavy-duty (Class 8) • Gasoline and spark-ignited engines (all classes)	Engine dynamometer testing	5% to 9%

Tractor Trucks (Classes 7 and 8). Tractor trucks are vehicles that are typically used to haul goods over long distances. These trucks account for a large percentage of fuel consumption and GHG emissions from the heavy-duty vehicle sector and thus attract the greatest amount of regulatory attention in the rule. There are nine separate standards for tractor trucks based on combinations of three categories of vehicles (Class 7, Class 8 day cab, and Class 8 sleeper cab) and three roof height categories (low, medium, and high), and regulatory stringency ranges from 9 to 23% for MY 2017 vehicles compared to the MY 2010 baseline.

Manufacturers must demonstrate compliance with the tractor standards using the Greenhouse gas Emissions Model (GEM), which is computer simulation program that was developed by the U.S. EPA and NHTSA. For tractors, inputs to the model include data on aerodynamics, tire rolling resistance, weight reduction, extended idle reduction, and vehicle speed limiting. In addition, there is also a separate standard for engines of tractor trucks as discussed below.

As with the U.S. national program, the trailers used in combination tractor trucks are not included in this rulemaking.

Commercial Pickups and Vans (Classes 2B and 3). This category of heavy-duty pickup trucks and vans are often very similar to their counterparts in the Class 2 (i.e. light-duty) category. Because of the similarities between the Class 2, 2B, and 3 vehicle categories, the testing and compliance approach is closely related to the program for light-duty vehicles. The Class 2B and 3 vehicles are tested on a chassis dynamometer with the stringency of the standards scaled by a newly created "work factor" that reflects the

vehicle's utility (i.e., hauling capacity, payload, and capacity for four-wheel drive). There are separate standards for diesel and gasoline vehicles, and in MY 2018 the average CO_2 emissions compared to a MY 2010 baseline must be 12% lower for gasoline vehicles and 17% lower for diesel vehicles.

Vocational Vehicles (Classes 2B to 8). This is a catchall category for rest of the medium- and heavy-duty vehicles that are not classified as tractors or heavy-duty pickup trucks or vans and includes a vast array of different vehicle configurations (bucket trucks, refuse vehicles, buses, etc.), duty cycles, and payloads. To avoid the regulatory compilations involved with designing standards for such a wide range of vehicles, the point of compliance is with the chassis manufacturer. Vocational trucks are divided into three sub-categories by weight: light heavy-duty (Class 2B to 5), medium heavy-duty (Class 6 and 7) and heavy heavy-duty (Class 8). Compared to the baseline MY 2010 values, the standards for MY 2014 are a 4 to 5% improvement, depending on the specific subcategory. The tightening of the standard in MY 2017 represents a 6 to 9% improvement over the MY 2010 values. As with tractors, the increased stringency in the MY 2017 standard is based solely on the MY 2017 engine improvements. Similar to the tractor program, there is a separate engine standard for this this group of vehicles. Manufacturers comply with the vocational vehicles standards using the GEM software by inputting tire rolling resistance test data.

Engines of Tractor Trucks and Vocational Vehicles. Engine testing for compliance with GHG standards will occur simultaneously with testing for criteria pollutants using the same procedures and test cycles that are currently used. In effect, three more pollutants must be measured and reported: CO_2, CH_4, and N_2O. The procedures to determine which engines must actually be tested will also remain the same as in current criteria pollutant testing. Engines will be categorized as light-heavy (Class 2B through 5), medium-heavy (Class 6 and 7) and heavy-heavy (Class 8) based on what vehicle class they are ultimately used in. Within each of these compliance categories, all engine models offered by each manufacturer will be grouped into engine families based on specific criteria that define engines with similar design characteristics. Manufacturers must select at least one engine from each family for testing, consistent with selection procedures defined in the U.S. Code of Federal Regulations (40 CFR Part 86).

In addition to the standards for tractors, pickup trucks and vans, and vocational vehicles, there are a number of special provisions and crediting options available to vehicle and engine manufacturers and importers. Some of these include:

- Special compliance provisions for gasoline and alternative fuel engines
- Alternative compliance pathway option for engine manufacturers
- Early credits for compliance prior to MY 2014
- Advanced technology credits for hybrid, all-electric, fuel cell vehicles, or engines with Rankine cycle waste heat recovery systems
- Innovative technology credits for technologies whose fuel use and emissions benefits are not readily captured over the engine test cycles or in GEM simulations (i.e. "off-cycle" benefits)

CANADA-SPECIFIC PROVISIONS

Averaging, Banking, and Trading. In terms of flexibility provisions, the regulations allow manufacturers and importers of heavy-duty vehicles and engines to meet the standards based on sales and averaging in the Canada 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; however, they do provide critical assurances and help better establish a durable regulatory program with accurately quantifiable impacts. To minimize the administrative burden on manufacturers and importers, Environment Canada has developed streamlined reporting procedures that are coordinated with the U.S. EPA.

An important exception to these ABT provisions is the case for importers and manufacturers of engines certified by the U.S. EPA, which, as described in the following section, 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.

Environment Canada is allowing engines that are certified by the U.S. EPA to be sold concurrently in Canada without demonstrating compliance based on Canada sales-weighted averaging. In other words, there will be more flexibility on the number engines that are certified at CO_2 levels that are higher than the standard that can be sold in Canada. 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. For an engine certified at CO_2 levels higher than the standard, if the number of engines sold in Canada (1) is more than 1,000 and exceeds the number of engines of the same engine family that is sold in the U.S. or (2) is between 101 and 1,000 and is more than twice the number of engines sold in the U.S., that engine must participate in the CO_2 emission credit system based on sales in Canada. This provision prevents the development of high-emitting niche engines for the Canada market. For context, the U.S. heavy-duty sales market is roughly 10 times greater than that of Canada.

Further, to provide more time to adjust product offerings to meet a Canadian specific average and because of a shorter lead time than the U.S., the regulations also include a phased-in approach by providing transitional measures over the 2014-2016 model years for vocational vehicles and tractors covered by an EPA certificate. To provide additional flexibilities, companies may opt to be exempted from the requirements the CO_2 emission credits system for all its 2014 model year vocational vehicles and tractors that are covered by a U.S. EPA certificate. In addition, companies are also permitted to exempt up to 50% of these vehicles of the 2015 model year and up to 25% of these vehicles of the 2016 model year from these requirements. This exemption is not available for the 2017 and beyond model years. Some restrictions apply to the use of early action credits and credits obtained during the 2014-2016 model year if a company chooses to take advantage of the transitional measures.

Environment Canada's analysis indicates that these additional flexibilities will not significantly impact the final positive outcome of the regulations.

REFERENCES

Environment Canada (EC) (2013). Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations. Ottawa, ON, Queen's Printer for Canada. **P.C. 2013-160:** 450-604.

The International Council on Clean Transportation (ICCT) (2011). Policy Update Number 14: U.S. Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles. Washington, DC, http://theicct.org/us-heavy-duty-vehicle-standards.