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**Fleet Average NO<sub>x</sub> Emission  
Performance of 2011 Model Year  
Light-Duty Vehicles, Light-Duty Trucks  
and Medium-Duty Passenger Vehicles**

In relation to the  
*On-Road Vehicle and Engine Emission Regulations*  
under the  
*Canadian Environmental Protection Act, 1999*

Transportation Division

March 2014

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Cat. No.: En81-10/2011E-PDF  
ISSN: 1927-2456

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## 1 Executive Summary

Under the *On-Road Vehicle and Engine Emission Regulations* (hereafter referred to as the “Regulations”), each new light-duty vehicle, light-duty truck and medium-duty passenger vehicle is required to be certified by its manufacturer to one of the bins corresponding to those of the United States Environmental Protection Agency for which there are specific emission standards for oxides of nitrogen (NO<sub>x</sub>) and other pollutants. In addition, manufacturers and importers of these vehicles are required to report on their fleet average NO<sub>x</sub> emission performance for each model year.

This report is the eighth annual performance report, and it summarizes the fleet average NO<sub>x</sub> emission performance of the Canadian 2011 model-year fleet of vehicles. A total of 23 companies submitted end-of-model-year reports comprising a total of 1 450 947 vehicles manufactured in Canada or imported into Canada for the purpose of first retail sale. The report includes the fleet average NO<sub>x</sub> value for each company as well as their emission credits/deficits. It also provides a comparison of the distribution of vehicles certified to the various emissions bins and the overall NO<sub>x</sub> performance with that of previous model years (i.e., 2004 to 2010 model years).

The average NO<sub>x</sub> value for the Canadian 2011 model year combined fleet of light-duty vehicles, light light-duty trucks, heavy light-duty trucks and medium-duty passenger vehicles is 0.06454148 grams/mile compared to the standard of 0.07 grams/mile. Each individual company had a fleet average NO<sub>x</sub> value that was at or below the standard, and all companies complied with the fleet averaging provisions of the Regulations based on their reports.

The average NO<sub>x</sub> value continued to decrease for the 2011 model year. This result is consistent with the environmental performance objectives of the Regulations.

## 2 Purpose

The purpose of this report is to summarize the fleet average NO<sub>x</sub> emission performance of individual companies and the overall Canadian fleet for the 2011 model year (MY) based on data submitted by companies in their end-of-model-year reports; furthermore, it is also to report on the effectiveness of the Canadian fleet average NO<sub>x</sub> emission program in achieving the environmental performance objectives.

## 3 Introduction

On January 1, 2004, the *On-Road Vehicle and Engine Emission Regulations* came into effect under the *Canadian Environmental Protection Act, 1999* (CEPA 1999). These Regulations introduced more stringent national emission standards for on-road vehicles and engines. The Regulations align Canada's emission standards for light-duty vehicles, light-duty trucks, medium-duty passenger vehicles, heavy-duty vehicles, heavy-duty engines and on-road motorcycles with those of the U.S. Environmental Protection Agency (U.S. EPA) through incorporation by reference to the U.S. Code of Federal Regulations (CFR).

The Regulations also establish fleet average NO<sub>x</sub> standards for light-duty vehicles<sup>(1)</sup> (LDV), light light-duty trucks<sup>(2)</sup> (LLDT), heavy light-duty trucks<sup>(3)</sup> (HLDT) and medium-duty passenger vehicles<sup>(4)</sup> (MDPV). Each new LDV, LLDT, HLDT and MDPV is required to be certified to one of the bins presented in Table 1, for which there are specific emission standards for NO<sub>x</sub> and other pollutants. A company's choice of bin to which individual vehicle models are certified in a given model year is limited by the obligation to comply with the fleet average NO<sub>x</sub> standards associated with that model year. Table 2 presents the applicable fleet average NO<sub>x</sub> standards for a company's fleet of LDV, LLDT, HLDT and MDPV.

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<sup>(1)</sup> Light-duty vehicles generally consist of passenger cars.

<sup>(2)</sup> Light light-duty trucks generally consist of vans, sport utility vehicles and pick-up trucks having a gross vehicle weight rating (GVWR) of 2 722 kg (6 000 pounds) or less.

<sup>(3)</sup> Heavy light-duty trucks generally consist of vans, sport utility vehicles and pick-up trucks having a GVWR of more than 2 722 kg (6 000 pounds) and up to 3 856 kg (8 500 pounds).

<sup>(4)</sup> Medium-duty passenger vehicles generally consist of heavier passenger-type vehicles, such as vans and sport utility vehicles having a GVWR greater than 3 856 kg (8 500 pounds) and less than 4 536 kg (10 000 pounds).

**Table 1: LDV, LLDT, HLDT and MDPV Full Useful Life Exhaust Emission Standards  
(grams/mile)**

Bin Number	NO <sub>x</sub>	NMOG	CO	Formaldehyde	PM
<b>11*</b>	0.9	0.28	7.3	0.032	0.12
<b>10*</b>	0.6	0.156/0.230	4.2/6.4	0.018/0.027	0.08
<b>9*</b>	0.3	0.090/0.180	4.2	0.018	0.06
*These bins are no longer available.					
<b>8</b>	0.20	0.125/0.156	4.2	0.018	0.02
<b>7</b>	0.15	0.09	4.2	0.018	0.02
<b>6</b>	0.10	0.09	4.2	0.018	0.01
<b>5</b>	0.07	0.09	4.2	0.018	0.01
<b>4</b>	0.04	0.07	2.1	0.011	0.01
<b>3</b>	0.03	0.055	2.1	0.011	0.01
<b>2</b>	0.02	0.01	2.1	0.004	0.01
<b>1</b>	0.00	0.00	0.0	0.000	0.00

*Notes: 1) The equivalent limits in units of grams/km are obtained by multiplying the grams/mile value by 0.621.*

*2) Bins 8 through 10 contain additional temporary, less stringent standards for certain pollutants and for certain vehicles.*

*3) Bin 11 was only available for MDPV for the 2004 to 2008 model years.*

*4) Bins 9 and 10 were only available for LDV and LLDT for the 2004 to 2006 model years and for HLDT and MDPV for the 2004 to 2008 model years.*

*5) Beginning in the 2009 model year, applicable standards are limited to bins 1 to 8 for all categories.*

**Table 2: Fleet Average NO<sub>x</sub> Standards  
(grams/mile)**

Model Year	LDV/LLDT	HLDT/MDPV
<b>2004</b>	0.25	0.53
<b>2005</b>	0.19	0.43
<b>2006</b>	0.13	0.33
<b>2007</b>	0.07	0.20
<b>2008</b>	0.07	0.14
<b>2009 and subsequent model years</b>	0.07	

A company's fleet average NO<sub>x</sub> value is the weighted average based on the number of vehicles certified to each bin. The emission bins, fleet average NO<sub>x</sub> standards, and methods of calculating fleet average NO<sub>x</sub> values are aligned with those of the U.S. EPA. However, there are differences in the structure of the NO<sub>x</sub> averaging program in Canada, which is designed to recognize vehicles that are sold concurrently in Canada and the U.S. The regulatory requirements are structured to deliver fleet average emissions comparable to those of the U.S. while minimizing the regulatory burden on companies and enabling the marketing of vehicles in Canada independently from the U.S.

The Regulations require that all companies submit a report to the Minister of the Environment no later than May 1 after the end of each model year. The end-of-model-year report must contain detailed information concerning the company's fleet(s) and/or groups of vehicles, including information related to the following:

- statements of allowable elections made by the company in complying with the fleet average NO<sub>x</sub> requirements of the Regulations, if any;
- the applicable fleet average NO<sub>x</sub> standard;
- the fleet average NO<sub>x</sub> value achieved by the company;
- the values used in calculating the company fleet average NO<sub>x</sub> value;
- calculation of NO<sub>x</sub> emission credits and/or deficits, if any;
- balance of credits or deficits;
- credit transfers to or from the company, if any.

For more information regarding the calculation of fleet average NO<sub>x</sub> values and NO<sub>x</sub> emission credits or deficits, please refer to the Regulations, which can be found on the Environment Canada CEPA Registry at [www.ec.gc.ca/CEPARegistry/regulations](http://www.ec.gc.ca/CEPARegistry/regulations). Reports for the 2004 to 2010 model years can also be found on the CEPA Registry.



## 4 Company Fleet Average NO<sub>x</sub> Emission Performance for the 2011 Model Year

### 4.1 Scope of Company Reports

Table 3 presents a list of the companies that submitted an end-of-model-year report for the 2011 model year in accordance with the requirements of the Regulations, including the vehicle makes as well as the number of test groups covered by their reports.

**Table 3: Scope of Company Reports**

Company	Makes	Number of Test Groups
Aston Martin Lagonda Limited	Aston Martin	2
BMW Group Canada	BMW, Mini, Rolls-Royce	20
Chrysler Canada Inc.	Chrysler, Dodge, Jeep	20
Ferrari North America, Inc.	Ferrari	2
Ford Motor Company of Canada, Limited	Ford, Lincoln	32
General Motors of Canada Limited	Buick, Cadillac, Chevrolet, GMC	28
Honda Canada Inc.	Acura, Honda	17
Hyundai Auto Canada Corp.	Hyundai	16
Jaguar (Jaguar Land Rover Canada ULC)	Jaguar	1
Kia Canada Inc.	Kia	17
Land Rover (Jaguar Land Rover Canada ULC)	Land Rover	2
Lotus Cars Limited	Lotus	2
Maserati North America, Inc.	Maserati	1
Mazda Canada Inc.	Mazda	14
Mercedes-Benz Canada Inc.	Maybach, Mercedes, Smart	18
Mitsubishi Motor Sales of Canada, Inc.	Mitsubishi	9
Nissan Canada Inc.	Infiniti, Nissan	25
Porsche Cars Canada, Ltd.	Porsche	13
Subaru Canada, Inc.	Subaru	4
Suzuki Canada Inc.	Suzuki	4
Toyota Canada Inc.	Lexus, Scion, Toyota	35
Volkswagen Group	Audi, Bentley, Lamborghini, Volkswagen	19
Volvo Cars of Canada Corp.	Volvo	4

*Note: A test group is the basic classification unit that comprises LDV, LLDT, HLDT or MDPV having similar exhaust emission performances and that share all of the features described in section 1827, subchapter C, part 86 of the CFR.*

A total of 23 companies submitted a report for the 2011 model year covering a total of 305 distinct test groups. It should be noted that certain test groups were common between companies that shared vehicle platforms or powertrains.

## 4.2 Company Fleet Average NO<sub>x</sub> Values

Table 4 summarizes the total number of vehicles and average NO<sub>x</sub> values for each company's combined fleet of LDV, LLDT, HLDT and MDPV.

**Table 4: Summary of Company Average NO<sub>x</sub> Values for the Combined Fleet of LDV, LLDT, HLDT and MDPV**  
Fleet Average NO<sub>x</sub> Standard = 0.07 grams/mile

Company	Total Number of Vehicles	Average NO <sub>x</sub> Value (grams/mile)
Aston Martin Lagonda Limited	83	0.070
BMW Group Canada	44 661	0.070000
Chrysler Canada Inc.	171 440	0.0539073
Ferrari North America, Inc.	164	0.0700
Ford Motor Company of Canada, Limited	246 820	0.0581502
General Motors of Canada Limited	248 938	0.0622566
Honda Canada Inc.	97 573	0.069479
Hyundai Auto Canada Corp.	100 516	0.0695722
Jaguar (Jaguar Land Rover Canada ULC)	1 022	0.07000
Kia Canada Inc.	65 034	0.069697
Land Rover (Jaguar Land Rover Canada ULC)	3 342	0.07000
Lotus Cars Limited	55	0.070
Maserati North America, Inc.	133	0.0700
Mazda Canada Inc.	66 565	0.069165
Mercedes-Benz Canada Inc.	31 619	0.068793
Mitsubishi Motor Sales of Canada, Inc.	21 882	0.070000
Nissan Canada Inc.	75 713	0.069870
Porsche Cars Canada, Ltd.	2 334	0.07000
Subaru Canada, Inc.	22 529	0.068035
Suzuki Canada Inc.	7 601	0.06895
Toyota Canada Inc.	170 470	0.0686468
Volkswagen Group	66 209	0.070000
Volvo Cars of Canada Corp.	6 244	0.07000

*Note: Fleet average NO<sub>x</sub> values are rounded to the same number of significant figures that are contained in the total number of vehicles in a company's fleet.*

The company average NO<sub>x</sub> values ranged from 0.0581502 grams/mile to 0.0700000 grams/mile for the fleet of LDV, LLDT, HLDT and MDPV, and no companies reported a fleet average NO<sub>x</sub> value that was above the standard of 0.07 grams/mile. Eleven out of 23 companies reported a fleet average NO<sub>x</sub> value that was equal to the fleet average NO<sub>x</sub> standard.

## 4.3 NO<sub>x</sub> Emission Credits/Deficits for the 2011 Model Year and End of Model Year Balance

Table 5 summarizes the NO<sub>x</sub> emission credits/deficits obtained by each company for the 2011 model year. It also lists the balance of credits for each company. Companies were assigned “0” for the “Total 2011 MY Credits” if they did not report credits, had a fleet average NO<sub>x</sub> value that was equal to the standard, or elected to exclude their group of vehicles from compliance with the fleet average NO<sub>x</sub> standard.

**Table 5: NO<sub>x</sub> Emission Credits/Deficits for the 2011 Model Year and End of Model Year Balance (vehicle-grams/mile)**

<b>Company</b>	<b>Initial Balance<sup>1</sup></b>	<b>Total 2011 MY Credits<sup>1</sup></b>	<b>New Balance<sup>1</sup></b>
Aston Martin Lagonda Limited	0	0 <sup>2</sup>	0
BMW Group Canada	913	0 <sup>3</sup>	913
Chrysler Canada Inc.	44 997	2 759	47 756
Ferrari North America, Inc.	0	0 <sup>4</sup>	0
Ford Motor Company of Canada, Limited	41 823	2 925	44 748
General Motors of Canada Limited	78 401	1 928	80 329
Honda Canada Inc.	20 129	51	20 180
Hyundai Auto Canada Corp.	3 163	43	3 206
Jaguar (Jaguar Land Rover Canada ULC)	126	0 <sup>3</sup>	126
Kia Canada Inc.	4 721	20	4 741
Land Rover (Jaguar Land Rover Canada ULC)	953	0 <sup>3</sup>	953
Lotus Cars Limited	0	0 <sup>4</sup>	0
Maserati North America, Inc.	0	0 <sup>4</sup>	0
Mazda Canada Inc.	15 034	56	15 090
Mercedes-Benz Canada Inc.	40	38	78
Mitsubishi Motor Sales of Canada, Inc.	76	0 <sup>5</sup>	76
Nissan Canada Inc.	18 854	10 <sup>5</sup>	18 864
Porsche Cars Canada, Ltd.	456	0 <sup>3</sup>	456
Subaru Canada, Inc.	2 665	44	2 709
Suzuki Canada Inc.	1 273	8	1 281
Toyota Canada Inc.	26 785	231	27 016
Volkswagen Group	0	0 <sup>3</sup>	0
Volvo Cars of Canada Corp.	3 538	0 <sup>3</sup>	3 538
<b>Total</b>	<b>263 947</b>	<b>8 113</b>	<b>272 060</b>

<sup>1</sup>NO<sub>x</sub> emission credits/deficits are rounded to the nearest whole number

<sup>2</sup>The company elected not to calculate an average NO<sub>x</sub> value pursuant to subsection 25(1) of the Regulations, as every vehicle conforms to a NO<sub>x</sub> standard equal to or less than the applicable fleet average NO<sub>x</sub> standard for that model year.

<sup>3</sup>The company reported a fleet average NO<sub>x</sub> value that is equal to the fleet average NO<sub>x</sub> standard.

<sup>4</sup>The company elected to exclude its entire fleet, which is sold concurrently in Canada and the U.S., from compliance with the fleet average NO<sub>x</sub> standard pursuant to subsection 31(1) of the Regulations.

<sup>5</sup>The company elected to exclude only parts of its fleet that satisfied the election from compliance with the fleet average NO<sub>x</sub> standard pursuant to subsection 31(1) of the Regulations. However, the average NO<sub>x</sub> value for the group of vehicles not subject to the election was equal to the fleet average NO<sub>x</sub> standard. Therefore, the company did not incur a deficit.

A total of 8 113 credits were generated by companies for the 2011 model year. No company incurred a deficit with respect to its 2011 model year fleet, and no company reported a negative balance of credits at the end of the 2011 model year. In addition, there were no transfers of credits to or from companies for the 2011 model year.

#### 4.4 Distribution of Bins and Total Canada NO<sub>x</sub> Fleet Average Value

Table 6 summarizes the distribution of vehicles by the NO<sub>x</sub> standard of each bin. It also provides the calculated fleet average NO<sub>x</sub> value of the entire Canadian fleet for the 2011 model year.

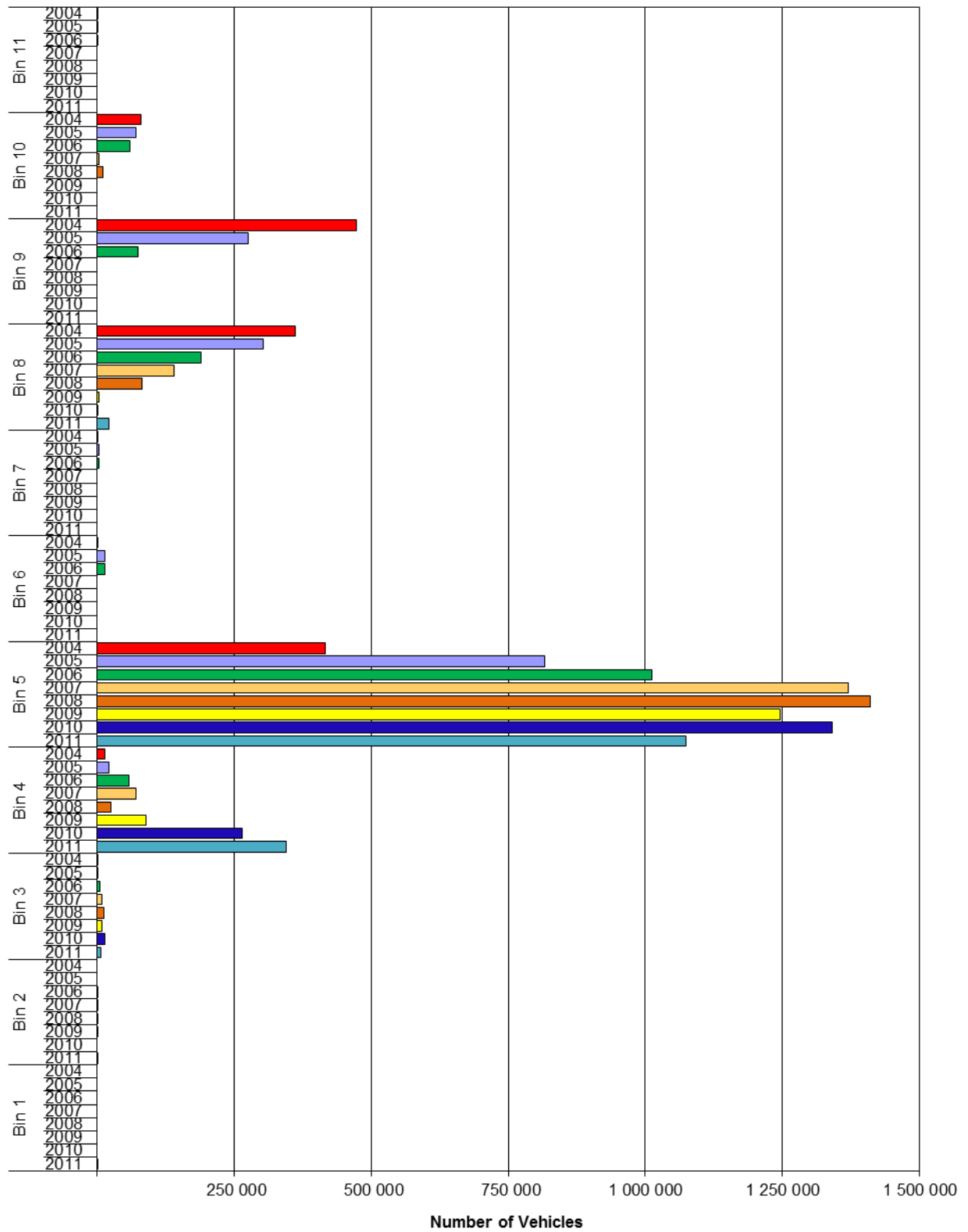
**Table 6: Distribution of Vehicles by the NO<sub>x</sub> Standard of Each Bin**

<b>Bin Number</b>	<b>NO<sub>x</sub> Standard (grams/mile)</b>	<b>Total Number of Vehicles in "Bin"</b>	<b>Percentage of Vehicles in "Bin"</b>
8	0.20	21 819	1.50
7	0.15	0	0.00
6	0.10	0	0.00
5	0.07	1 074 703	74.07
4	0.04	344 878	23.77
3	0.03	7 091	0.49
2	0.02	2 270	0.16
1	0.00	186	0.01
<b>Total Number of Vehicles in 2011 MY Fleet</b>			<b>1 450 947</b>
<b>Total Canada NO<sub>x</sub> Fleet Average (grams/mile)</b>			<b>0.06454148</b>
<b>Fleet Average NO<sub>x</sub> Standard (grams/mile)</b>			<b>0.07</b>

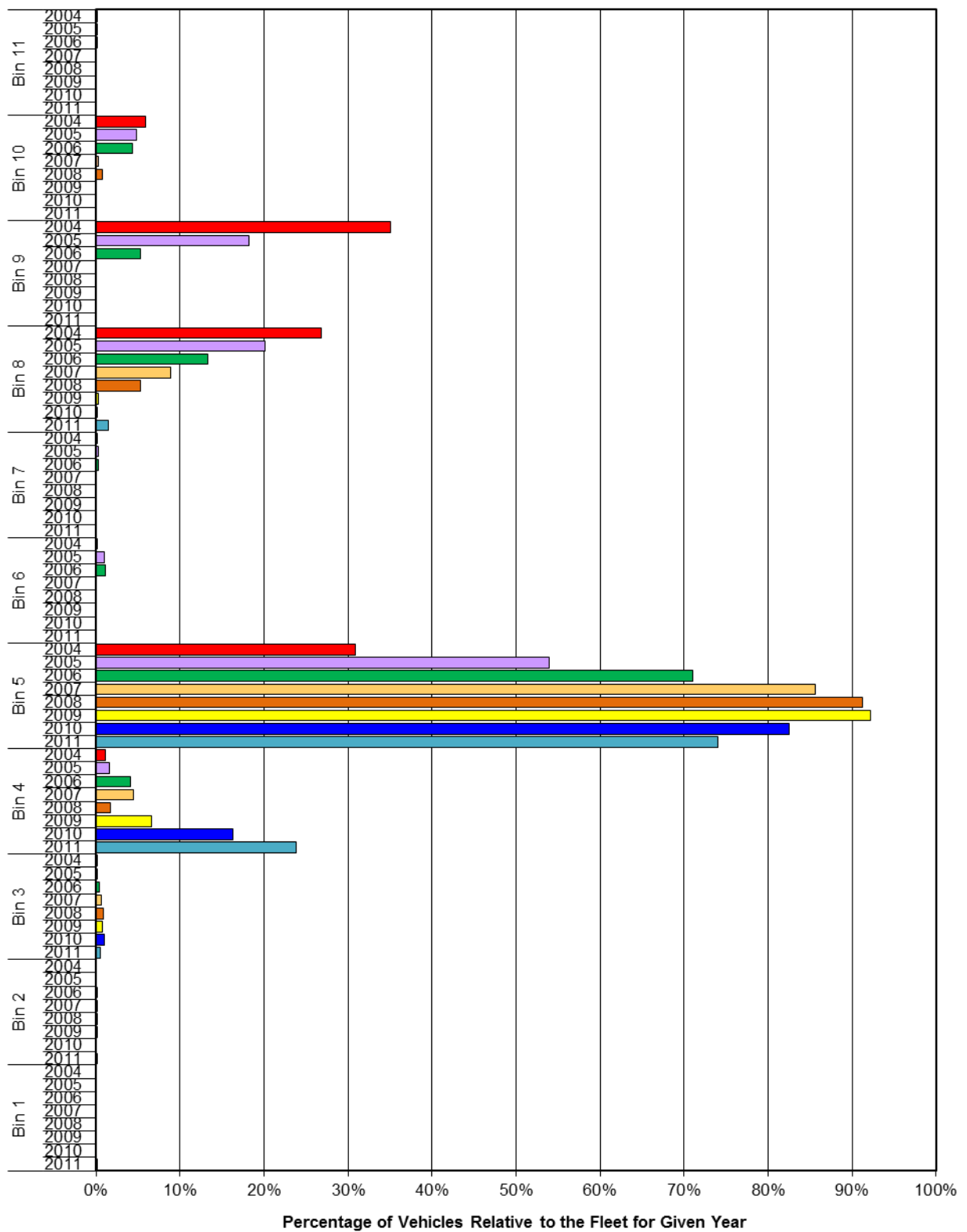
For the 2011 model year, almost all vehicles (98.5% of the fleet) were certified to a bin at or below the fleet average NO<sub>x</sub> standard of 0.07 grams/mile. The average NO<sub>x</sub> value for the Canadian fleet was 0.06454148 grams/mile, which is 7.8 % below the standard. For the first time, the Canadian fleet contains vehicles that were certified to Bin 1 (0.01% of the fleet).

Figure 1 depicts the changing distribution of the combined Canadian fleet by the NO<sub>x</sub> standard of each bin across the 2004 to 2011 model years. In addition, Figure 2 presents this information on a percentage basis to facilitate year-to-year comparison.

**Figure 1: Distribution of the Canadian Fleet by Number of Vehicles in Each Bin**



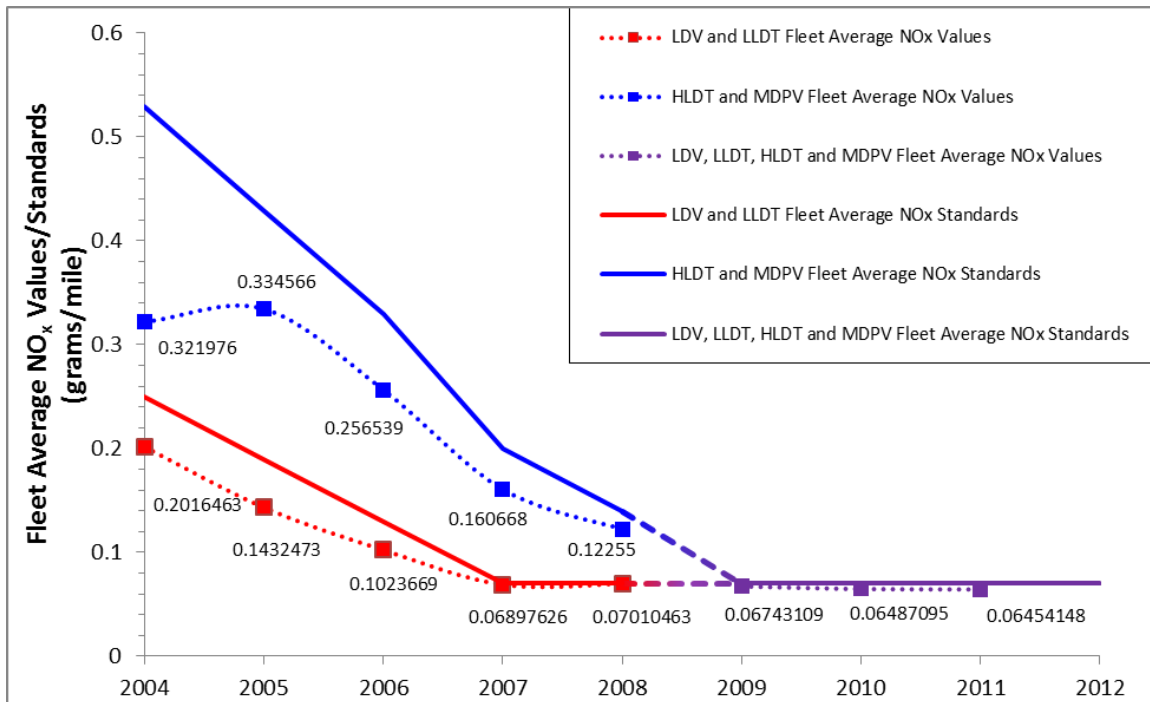
**Figure 2: Distribution of the Canadian Fleet by the Percentage of Vehicles Relative to the Fleet in Each Bin**



#### 4.5 Fleet Average NO<sub>x</sub> Values Trend

Figure 3 presents the average NO<sub>x</sub> values trend relative to the applicable standards since 2004 for both the LDV/LLDT and HLD/MDPV fleets. The fleet of LDV, LLDT, HLD/MDPV is now subject to a single combined fleet average standard of 0.07 grams/mile instead of two different standards. As a result, the fleet average NO<sub>x</sub> values for the 2009 to 2011 model years are shown as single points.

**Figure 3: Fleet Average NO<sub>x</sub> Values and Standards**



Overall, the fleet average NO<sub>x</sub> value for the combined fleet of LDV, LLDT, HLD/MDPV decreased from 2004 to 2011. More specifically, the fleet average NO<sub>x</sub> value for the 2011 model year continues to decrease and is 7.8% below the standard of 0.07 grams/mile.

## **5 Conclusions**

This is the eighth year that companies were subject to the fleet average NO<sub>x</sub> requirements under the Regulations. A total of 23 companies submitted reports for a total of 305 distinct test groups comprising 1 450 947 vehicles that were either manufactured in Canada or imported into Canada for the purpose of first retail sale.

The average NO<sub>x</sub> value for the Canadian 2011 model year combined fleet of LDV, LLDT, HLDT and MDPV is 0.06454148 grams/mile compared with the standard of 0.07 grams/mile. Each individual company had a fleet average NO<sub>x</sub> value that was at or below the standard, and all companies complied with the fleet averaging provisions of the Regulations based on their reports.

The average NO<sub>x</sub> value continued to decrease for the 2011 model year. This result is consistent with the environmental performance objectives of the Regulations.