EPA United States Environmental Protection Agency

2007 Progress Report

Vehicle and Engine Compliance Activities

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United States Environmental Protection Agency
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I. Introduction

Welcome to the first compliance report of the U.S. Environmental Protection Agency's (EPA's) Office of Transportation and Air Quality (OTAQ). The purpose of this report is to present a convenient reference for the environmental data we generate about "mobile sources," or moving sources of air pollution. These sources include vehicles, engines, and motorized equipment that produce exhaust and evaporative emissions. It is our job to regulate these sources of air pollution and make sure that they comply with emissions and fuel economy requirements.

Specifically, this report summarizes vehicle and engine compliance program data we collected in 2007. These data include test results from model year (MY) 2007 certification activities plus other types of compliance reports and test results produced during calendar year 2007. Sales data presented in this report are based on MY 2006 sales because MY 2007 sales data were not yet available at the time of publication. National emissions inventory data are also for 2006, as those were the most recent data at the time of publication.

The United States has the most far-reaching emission control programs in the world; however, regulations in and of themselves do not achieve clean air. The goal of our compliance programs is to deliver on the regulatory promise of environmental and public health benefits by implementing emission standards covering every vehicle, engine, and gallon of fuel sold in this country and ensuring that these standards are met over the life of the product.

Our program is comprehensive in tracking compliance at every stage of useful life. We work closely with industry, years before new products appear in the market, to review engineering concepts for technical viability. Later we follow up to check emissions performance by testing vehicles before production begins and again after they enter actual customer service. When necessary, we collaborate with EPA's Office of Enforcement and Compliance Assurance (OECA) to inititiate enforcement actions in cases of legal violations. This comprehensive approach is critical to the success of air quality improvements. Collectively, our four most recent major programs have air quality and public health benefits that are projected to exceed $180 billion annually by 2030.

The data presented in this report highlight four important areas in EPA's oversight of vehicle and engine emissions. First, OTAQ's certification and compliance programs are growing. For example, in 2007, OTAQ issued over 3,500 certificates of conformity to vehicle and engine manfuacturers, with this number projected to significantly increase in the next few years. Second, light-duty vehicles are being certified at very clean levels, with most vehicles meeting the Tier 2 Bin 5 emissions requirements with a significant compliance margin as well. Third, we have initiated an expansion in certification and compliance activity to adddress new regulations, new technologies, new manufacturers, and new regulatory flexibilities, as well as new challenges due to growth in imports. These new programs are derived from EPA testing as well as analysis of data provided to the Agency under manufacturer-run, in-field testing programs. In coming years, this expansion will be particularly important in the newer nonroad and heavy-duty areas. Lastly, OTAQ compliance activities are critically important to achieving the air quality benefits promised by emissions regulations. However, even in the relatively mature light-duty area, more than 2.5 million vehicles were affected by emissions-related voluntary recalls in 2007.

In future reports, we expect to update these analyses as well as provide new information as programs evolve and new data become available.

[1] Please refer to our Fuel Trends Report: Gasoline 1995 –2005 (EPA-420-R-08-002, January 2008) for data on our fuel programs.

II. Scope

A. Legal Authority

EPA derives authority to do its work through a variety of statutes enacted by Congress. Table 1, below, summarizes the statutes that give OTAQ the authority to develop and implement mobile source emission control programs.

These statutes authorize EPA to regulate nearly all engines and vehicles that emit pollutants into the environment, from locomotives to leaf blowers. OTAQ's compliance programs play an essential role in realizing the benefits of these regulations.

Table 1. Statutes

Statute	Authority
Clean Air Act (CAA)	Emission standards for highway and nonroad vehicles and their fuels
Energy and Policy Conservation Act	Fuel economy information programs for consumers, including fuel economy labeling and the publication of an annual fuel economy guide
Energy Independence and Security Act	Renewable fuels

B. Vehicle and Engine Categories Regulated by EPA

OTAQ's compliance programs are vast in scope and comprehensive in coverage to ensure that vehicle and engine manufacturers and fuel refiners and producers comply with regulations. The programs employ flexible yet comprehensive compliance strategies to address the unique challenges faced by particular industry sectors.

Table 2, on the next page, describes EPA vehicle and engine regulations by industry and model year of implementation. It is an abbreviated list of mobile source regulatory implementation dates and reflects emission standards proposed or established in 2004 and later years. For earlier emission standards, please visit www.gpoaccess.gov/cfr.

Table 2. Vehicle and Engine Programs and Implementation Dates

Program/Rule	Affected Industries/Vehicles	Effective Model Year	Description
Tier 2 Emission Standards and Gasoline Sulfur Control	Cars and Light Trucks	2004	Establishes a more stringent set of emission standards that applies to both cars and light trucks regardless of fuel type
Heavy-Duty Highway Rule	Trucks and Buses	2007	Establishes more stringent exhaust emission standards and requires ultra-low sulfur diesel (ULSD) fuel (15 ppm maximum)
Tier 4 Nonroad Diesel Rule	Construction and Agriculture Equipment	2008 (for emissions) 2010 (for fuel)	Establishes more stringent exhaust emission standards and requires ULSD fuel (15 ppm maximum)
New Emission Standards for Large Spark-Ignition (SI) Engines	Forklifts and Generators	2004 (Tier 1) 2007 (Tier 2)	Establishes new emission standards, plus requirements for in-use emission testing and computerized diagnostics
New Nonroad SI Engines, Equipment, and Vessels	Lawn and Garden Equipment Boats and Personal Watercraft	2012 (Class I) 2011 (Class II) 2010	Establishes more stringent exhaust emission and fuel permeation standards for small SI engines below 19 kilowatts and new evaporative emission standards for inboard, outboard, stern-drive, and personal watercraft engines
Tier 3 and 4 Emission Standards for Marine Diesel Engines	Commercial and Recreational Boats and Ships	2009 (Tier 3) 2014 (Tier 4)	Establishes more stringent exhaust emission standards for newly built engines; requires highly efficient, advanced emission control technology; and establishes first exhaust emission standards for remanufactured engines
Tier 3 and 4 Emission Standards for Locomotive Diesel Engines	Commercial Trains	2011 (Tier 3) 2015 (Tier 4)	Establishes more stringent exhaust emission standards for newly built engines; requires highly efficient, advanced emission control technology; and establishes first exhaust emission standards for remanufactured engines
New Emission Standards for Commercial Aircraft Jet Engines	Commercial Aircraft Engines	2005	Establishes more stringent exhaust emission standards for engines certified after 2005
Tier 1 and 2 New Emission Standards for Motorcycles	On-Highway Motorcycles	2006 (Class I and II) 2006 (Class III, Tier 1) 2010 (Class III, Tier 2)	Establishes new exhaust and evaporative emission standards for all displacements

C. Fuels Regulated by EPA

EPA regulates all mobile source gasoline and diesel fuel and recently began regulating the use of renewable fuels such as ethanol and biodiesel. This is an abbreviated list of major ongoing fuels regulations. For a comprehensive list, please visit www.epa.gov/otaq/fuels.htm. For more information on our fuel programs, please refer to our Fuel Trends Report: Gasoline 1995–2005 (EPA-420-R-08-002, January 2008).

Table 3. Fuel Programs and Implementation Dates

Affected Fuel Type— Applicable Fuel Producer or Importer	Program/Rulemaking Description	Effective Implementation Date
All motor vehicle fuels and fuel additives— *Gasoline and diesel refiners and importers, renewable fuel producers and importers, fuel additive producers and importers*	Fuels and Fuel Additives Registration System (FFARS): • Mandatory registration program for all motor vehicle fuels and fuel additives sold in the United States. • Requires all fuel and fuel additive manufacturers to report on the chemical composition of their products and other technical, sales, and health effects information.	1994
Gasoline— *Gasoline refiners and importers*	• **Volatility standards** limit the vapor pressure of gasoline sold at retail stations during the summer ozone season to reduce evaporative emissions from gasoline, which contribute to ground-level ozone formation.	1989
	• **Oxyfuel requirements** reduce emissions of carbon monoxide from motor vehicles during the winter season.	1992
	• **Reformulated gasoline requirements** reduce smog-forming and toxic pollutants in U.S. cities with the worst smog pollution.	1995
	• **Tier 2 emission standards and gasoline sulfur regulations** establish stringent exhaust emission standards for all fuel types and limit fuel sulfur levels to 30 ppm on average.	2004
	• M**obile source air toxics regulations** will limit the benzene content of gasoline and reduce toxic emissions from passenger vehicles and portable gas cans.	2011
Diesel— *Diesel producers and importers*	Highway, Nonroad, Locomotive & Marine Rules: • Suite of rules for highway, nonroad, locomotive, and marine diesel engines requires ULSD (15 ppm maximum).	2006

III. Contribution of Mobile Sources to Air Pollution

A. Contribution of Major Pollution Source Categories to National Air Quality

This section presents EPA's estimates of national emissions for several regulated air pollutants: carbon monoxide (CO), nitrogen oxides (NO_x), volatile organic compounds (VOCs), and particulate matter (PM) less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$). These pollutants are produced by many types of engines, industries, and commercial operations. For purposes of this report, the categories have been broadly defined at the national level as fuel combustion, industrial, solvent/storage/waste/recycling, mobile sources, and other. The footnote below provides more detail as to the specific make-up of each source category.*

Figures 1 through 4 compare mobile source emissions to the national emissions inventory. Nationwide, mobile sources are the primary source of CO emissions, account for more than half of the NO_x emissions, more than one-third of VOC emissions, and less than 10 percent of $PM_{2.5}$ emissions.

While mobile sources are important contributors to total national emissions, they are the dominant emissions sources in many individual urban areas. In addition, mobile sources contribute to higher localized levels of pollutants near roads and transportation facilities. Because so many people live and work near roads, mobile source emissions have a particularly important impact on people's exposure and health.

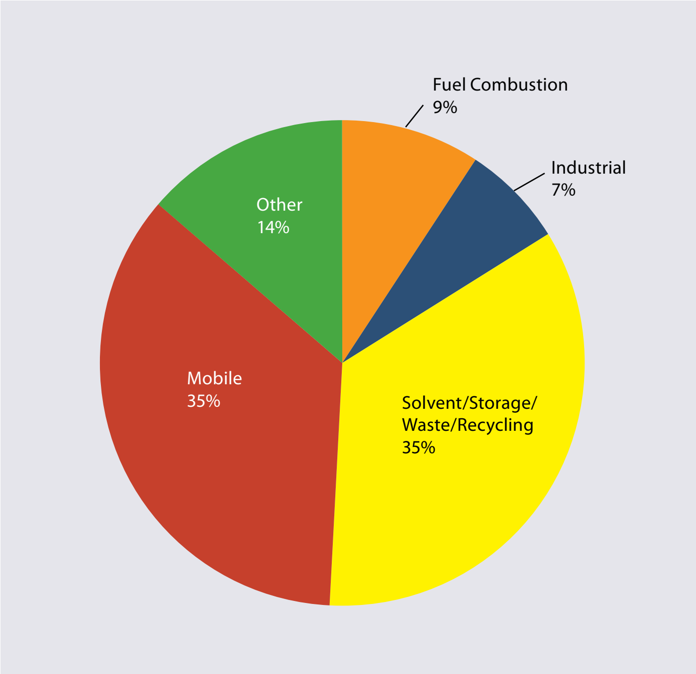


Figure 1. U.S. VOC Emissions by Category, 2006

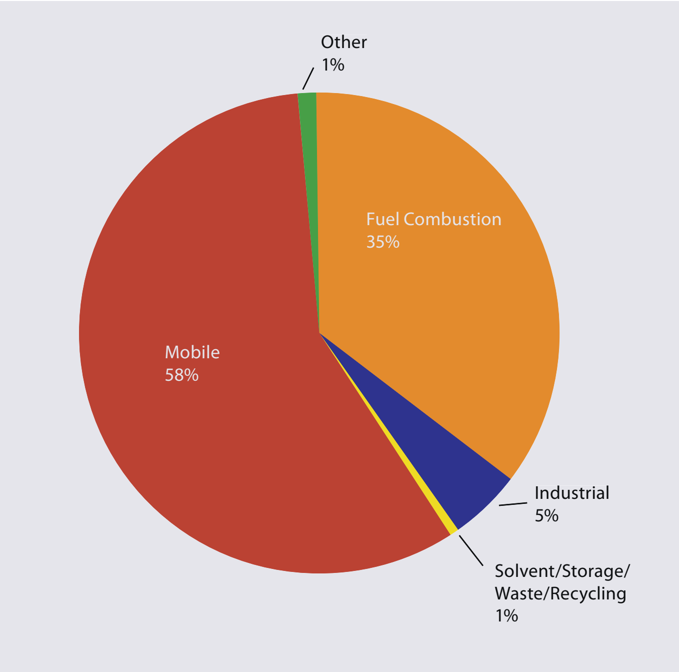


Figure 2. U.S. NO_x Emissions by Category, 2006

* Fuel Combustion: Electric Utility, Industrial, Other; Industrial: Chemical & Allied Manufacturing, Petroleum & Related Industries, Other Industrial Processes; Solvent/Storage/Waste/Recycling: Solvent Utilization, Storage & Transportation, Waste Disposal & Recycling; Mobile Sources: Highway Vehicles, Off-Highway; Other.

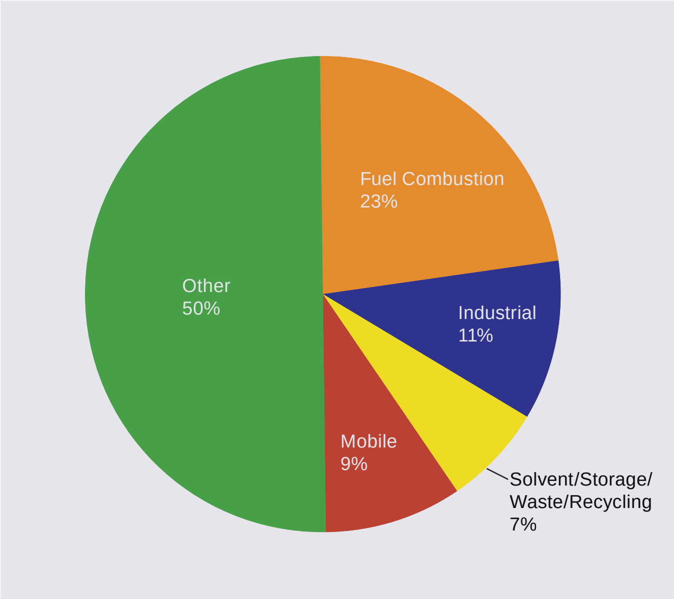


Figure 3. U.S. $PM_{2.5}$ Emissions by Category, 2006

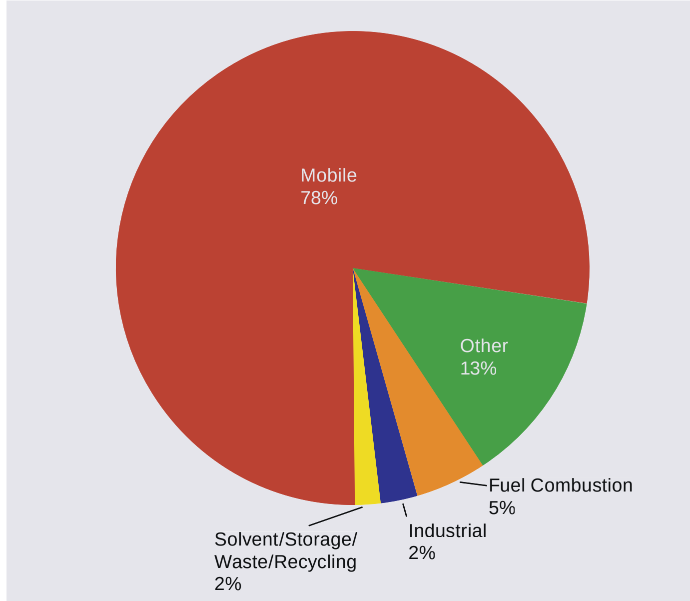


Figure 4. U.S. CO Emissions by Category, 2006

B. Contribution of Engine, Vehicle, and Equipment Industry Sectors to Mobile Source Emissions

Figures 5 through 8 show how much the various engine, vehicle, and equipment industry sectors contribute to overall mobile source VOC, NO_x, PM, and CO emissions. For additional context, Figure 9 provides a snapshot of the total engine, vehicle, and equipment population (total engines, vehicles, and equipment in the fleet) by industry that is currently subject to EPA regulations. Cars and trucks are the largest contributors to VOC and CO emissions. Diesel trucks and buses are the biggest source of NO_x, and large diesel construction and agricultural equipment are the biggest contributor to $PM_{2.5}$.

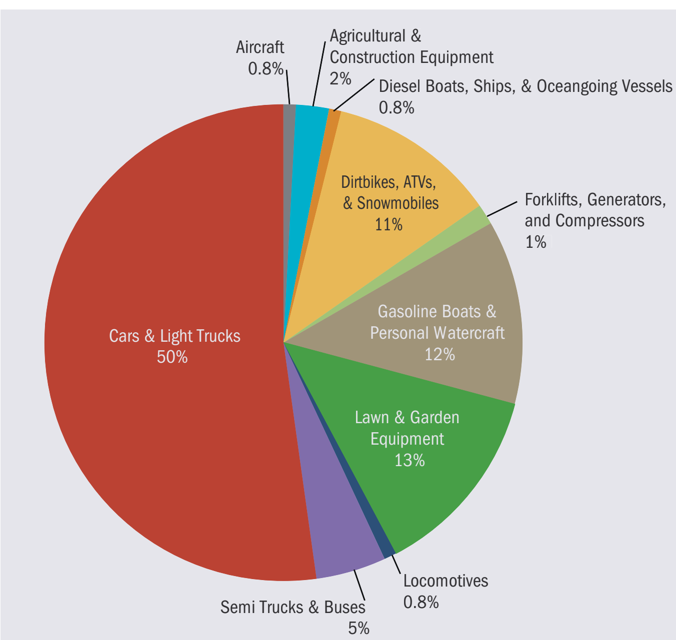


Figure 5. Mobile Source VOC Emissions by Sector, 2007

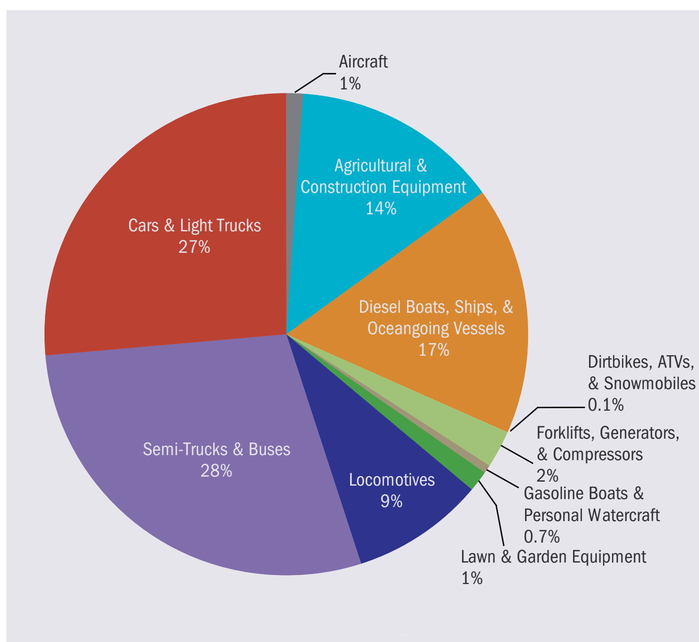


Figure 6. Mobile Source NO_x Emissions by Sector, 2007

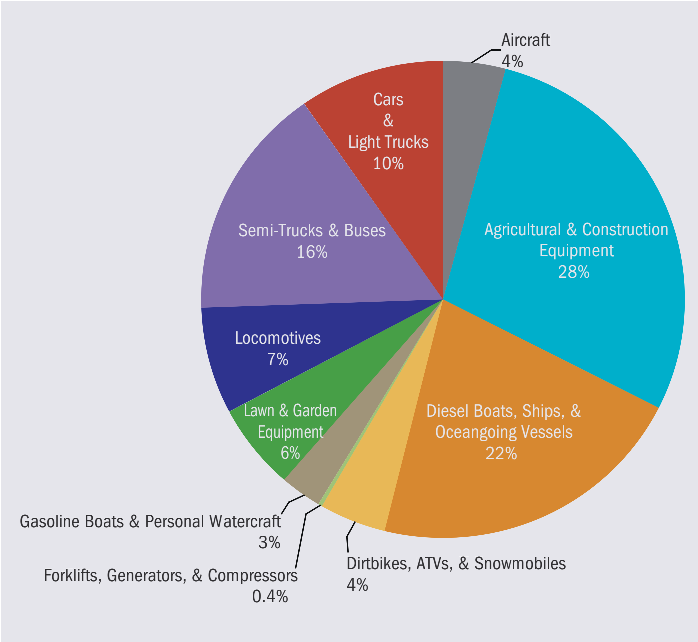


Figure 7. Mobile Source $PM_{2.5}$ Emissions by Sector, 2007

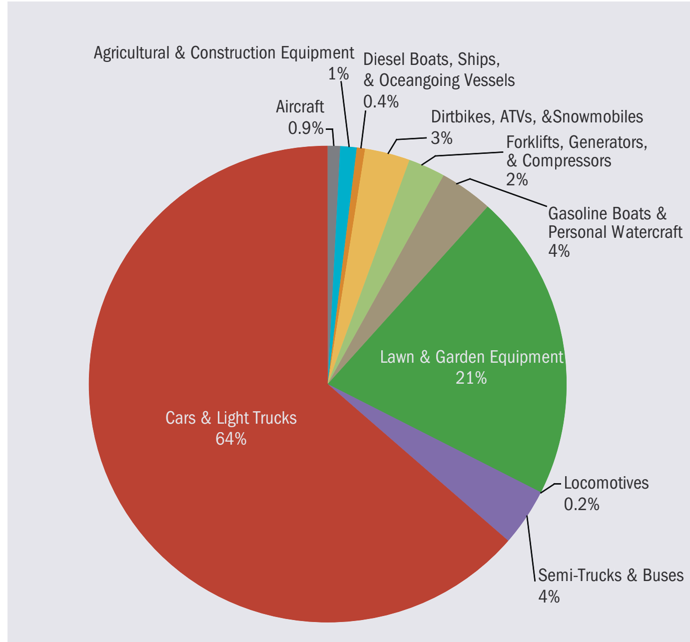


Figure 8. Mobile Source CO Emissions by Sector, 2007

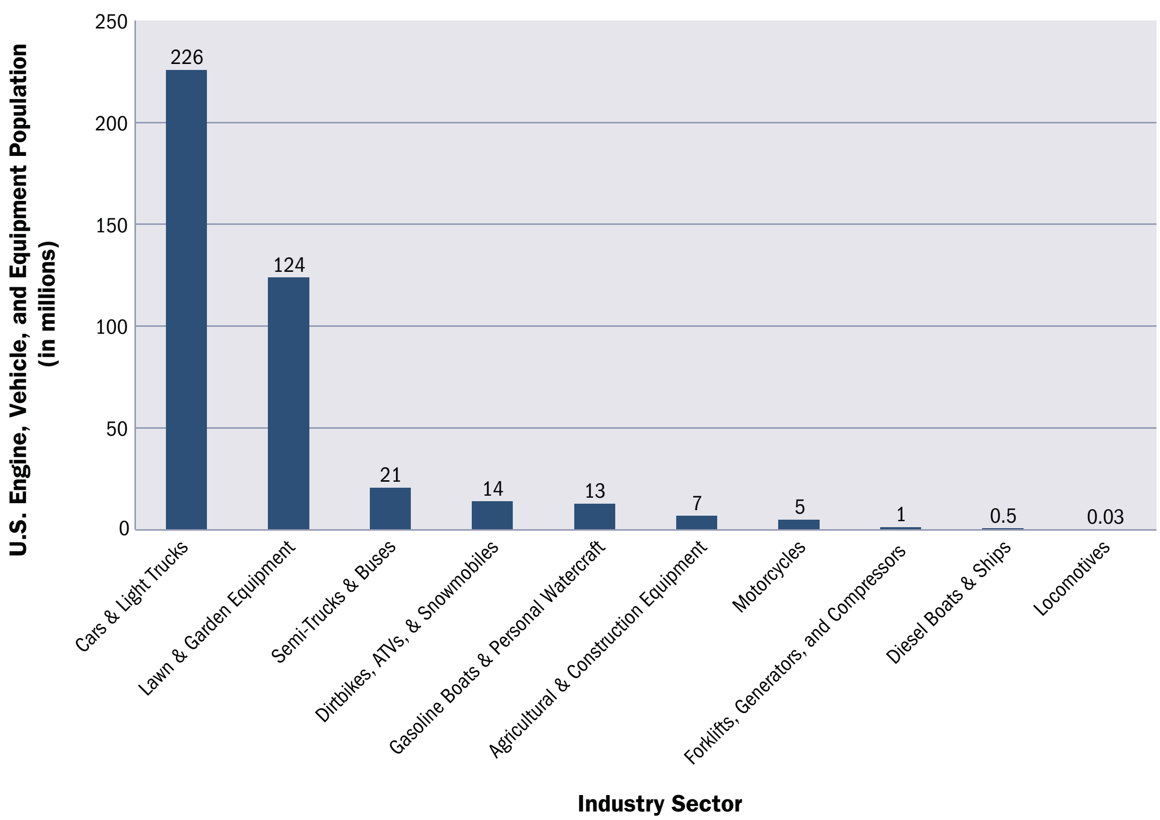


Figure 9. Engine, Vehicle, and Equipment Population by Industry Sector, 2007

IV. Vehicle and Engine Compliance Program

OTAQ employs a variety of strategies to oversee compliance with mobile source regulations. These include pre-production certification, confirmatory testing, production line testing, selective enforcement audits, and in-use testing.

The in-use compliance activities serve as feedback for the vehicle/engine certification process and encourage good emission control technology design and durability.

Figures 10 and 11 represent the compliance life cycle of a typical vehicle/engine certified by EPA. These figures show the activities of both EPA and the manufacturer at different phases in the life cycle. (Note: Manufacturer-run in-use testing programs are not required for all nonroad categories.)

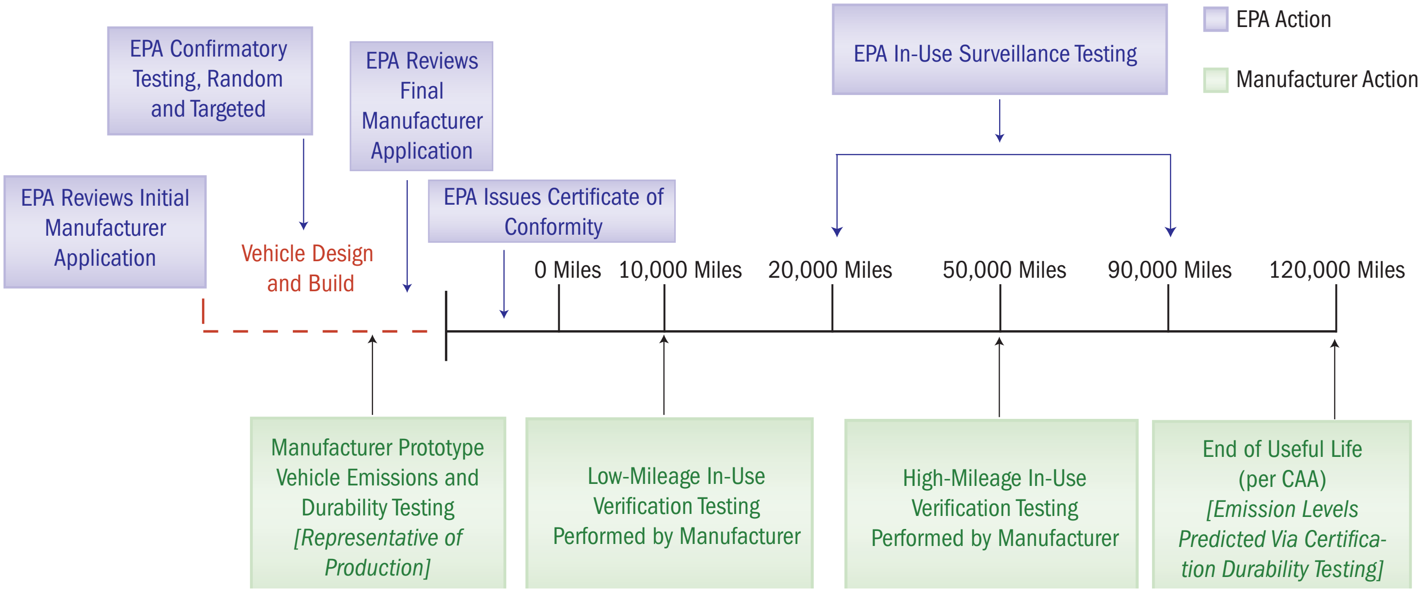


Figure 10. Compliance Life of a Light-Duty Vehicle

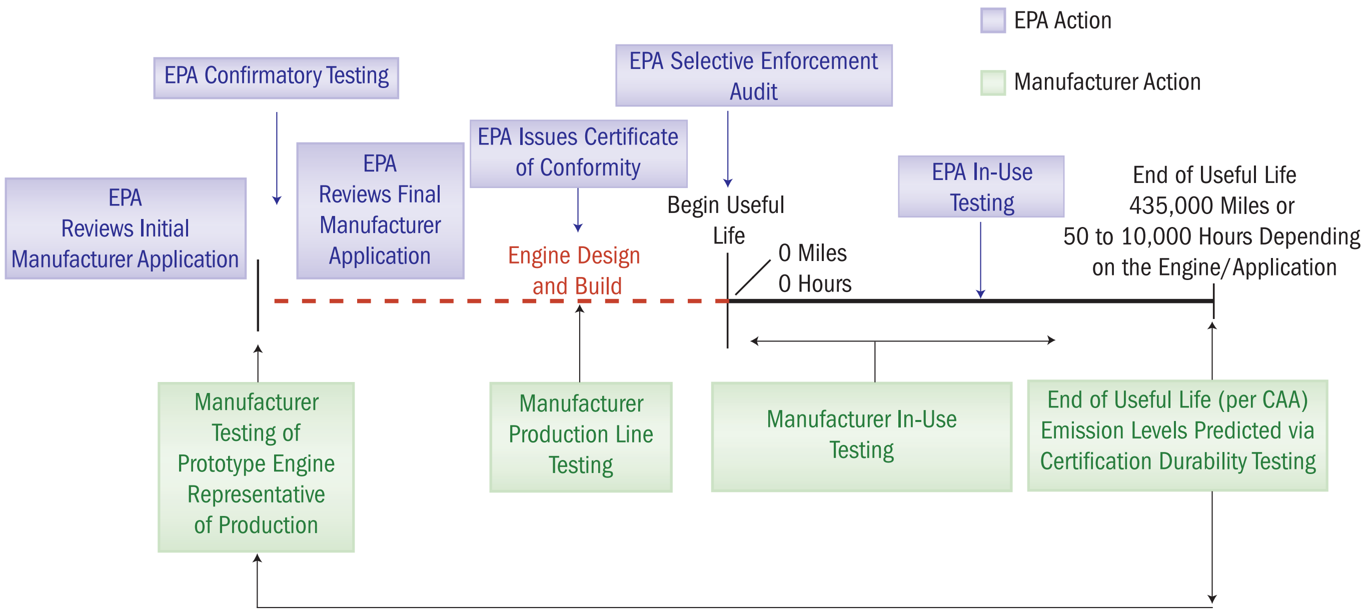


Figure 11. Compliance Life of a Heavy-Duty Highway and Nonroad Engine

Table 4 below shows the testing programs EPA and industry conducted to assess compliance in 2007. EPA has the legal authority to use any of these compliance tools for any industry sector, but typically chooses the tests that best fit an industry sector at any given time. Decisions are based on factors such as the technology being used to meet the emission standards, industry-specific production processes and cycles, and sector/manufacturer size.

Table 4. Pre-Production, Production, and Post-Production Compliance Processes by Industry Sector, 2007

Industry Sector			Pre-Production			Production		Post-Production
			Certification	Confirmatory Testing	Fuel Economy	Production Line Testing	Selective Enforce-ment Audits	In-Use
On-Road	Light-Duty	Cars, pickup trucks, sport utility vehicles (SUVs)	✔	✔	✔			✔
		Motorcycles	✔					
	Heavy-Duty	Trucks and buses	✔					✔
Nonroad	Gasoline-Powered	Lawn and garden equipment, locomotives, and marine vessels	✔	✔		✔		✔
	Diesel-Powered	Construc-tion and agriculture equipment	✔	✔				✔

A. Pre-Production Certification

1. Application for Certification

The certification process begins when a manufacturer submits an application for certification to EPA for a group of vehicles or engines having similar design and emission characteristics. Such groups are referred to as "test groups," or engine families. EPA requires manufacturers to provide detailed information to show that they have met all of the applicable requirements to qualify for a certificate of conformity. The application for certification describes those vehicles or engines specifically covered by the certificate of conformity. The certificate is a license to produce and sell the vehicle and covers only those vehicles or engines specifically described in the application. The list below generally describes the information and data that manufacturers must submit to begin the application process:

- A description of the basic engine design and list of distinguishable configurations to be included in the test group or engine family
- An explanation of how the emission control system operates
- A description of the test engine representing the test group or engine family
- A description of the test procedures and equipment used to test the engine
- All emission data obtained on each test engine
- The intended useful life of the family and emission deterioration characteristics over this useful life
- The production volumes of each configuration in the test group or engine family
- An unconditional statement certifying that all engines included in the engine family comply with all requirements of the applicable regulation and the CAA
- Manufacturer representative and official company contact information
- Durability grouping (i.e., groups of vehicles/engines with similar emission deterioration and emission component durability)
- Durability test procedures
- Description of each test group/engine family
- Description of vehicles used to demonstrate tailpipe emissions and emission control component durability
- List of all test results, official certification levels, and the applicable emission standards for each vehicle/engine tested
- Statement of compliance with the applicable emission standards for all other vehicles not tested
- Evaporative and On-Board Recovery Vapor Refueling (ORVR) system information (light-duty only)
- Information on emission control diagnostic systems (i.e., On-Board Diagnostics [OBD]) (light-duty only)

2. Certificates of Conformity

a. *Engines and Vehicles Produced by Original Engine Manufacturers*

Section 206 of the CAA requires that all engines and vehicles be covered by a certificate of conformity before they can enter into commerce. A certificate of conformity demonstrates that the respective engine or vehicle conforms to all of the applicable emission requirements. The certificate represents engines and vehicles covered by a specific engine family or, in the case of light-duty vehicles, a specific test group for each manufacturer. Figure 12 shows test groups of MY 2007 certified cars and light trucks by manufacturer.

For MY 2007, EPA issued 3,550 certificates for engines and vehicles covering more than 17 different categories, or industry sectors. Table 5 lists the number of certificates issued for the various categories. The number of certificates issued ranged from 1,084 for lawn and garden equipment to two for heavy-duty engines (California-only certificates).

Figure 13 presents MY 2006 car and light truck sales by manufacturer.

Table 5. Number of MY 2007 Certificates	
Category	Certificates
Lawn and Garden Equipment	1,084
Agricultural and Construction Equipment	676
Cars and Light Trucks	427
Motorcycles	418
All-Terrain Vehicles	309
Diesel Boats, Ships, and Oceangoing Vessels	117
Gasoline Boats and Personal Watercraft	112
Nonroad Motorcycles	106
Locomotives	60
Semi-Trucks and Buses (Diesel)	58
Semi-Trucks and Buses (Gasoline)	38
Snowmobiles	37
Forklifts, Generators, and Compressors	34
Oceangoing Vessels	31
Light-Duty Vehicle Independent Commercial Importers	22
Heavy-Duty Engine Evaporatives	19
Heavy-Duty Engine (California)	2
TOTAL	3,550

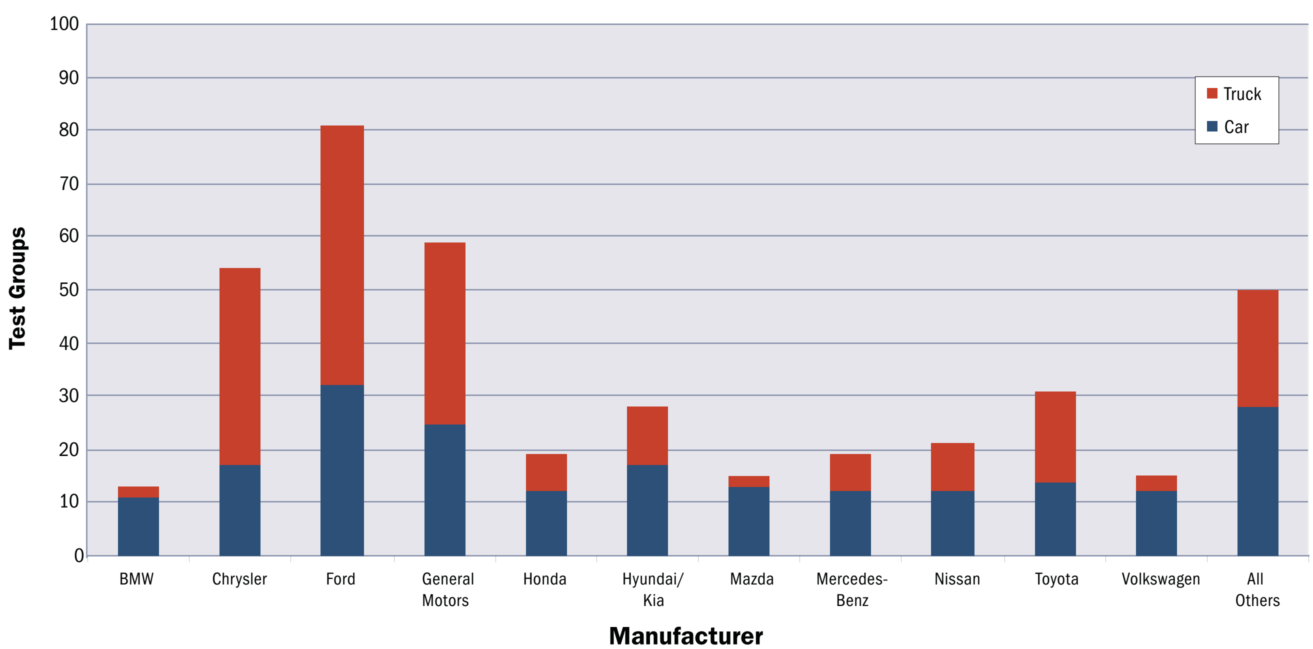


Figure 12. MY 2007 Certified Car and Light Truck Test Groups by Manufacturer

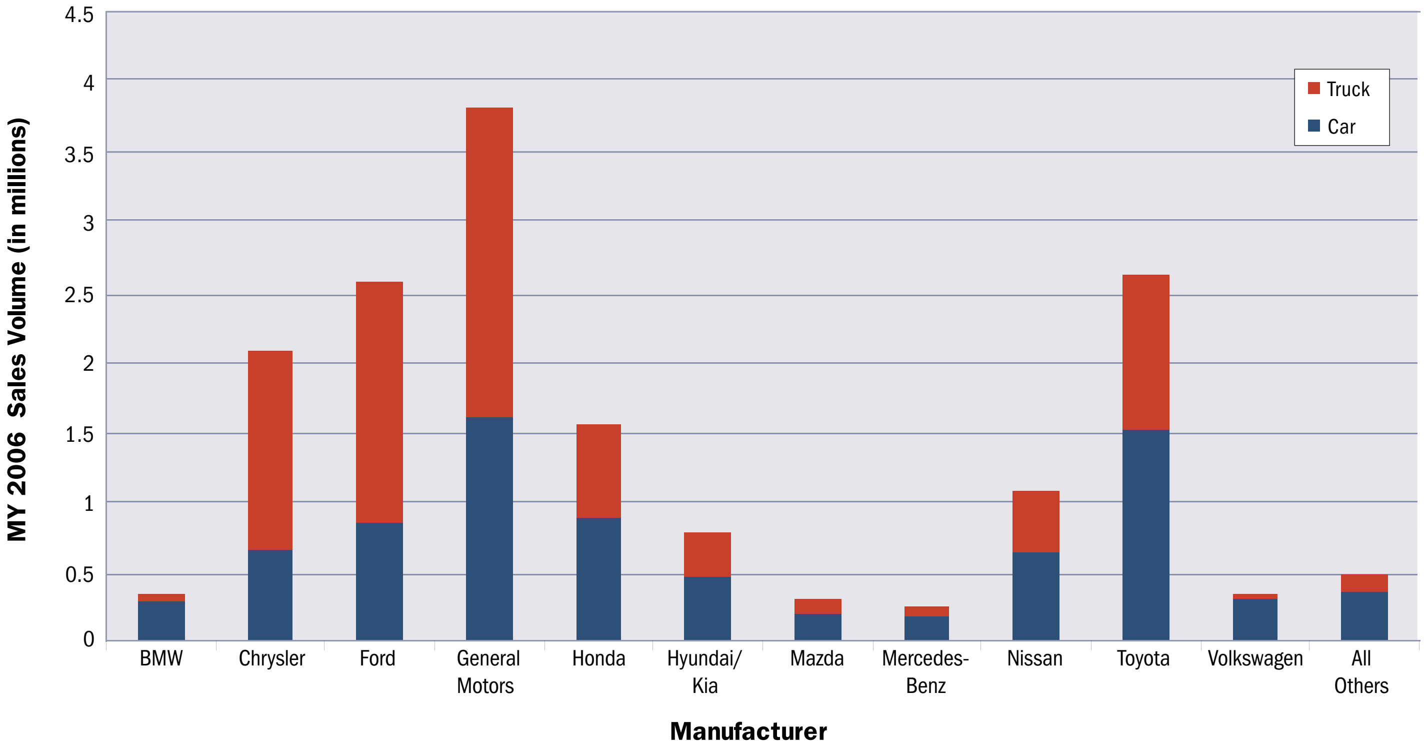


Figure 13. MY 2006 Car and Light Truck Sales by Manufacturer

We have also presented the 2006 sales information for motor vehicles and engines two different ways to give an approximate snapshot of where products are manufactured or where primary corporate functions are located.

Figures 14 and 15 show the country of origin of all MY 2006 vehicles sold in the Unites States. The country of origin for a vehicle is the country where a manufacturer's headquarters are located. For example, Toyota's corporate headquarters are in Japan. Thus, we consider Toyota's country of origin to be Japan.

Based on this definition of the country of origin, each bar in these graphs represents the total number of MY 2006 vehicles sold from each representative manufacturer. Each bar is further split into manufacturers originating from that country, along with their sales numbers.

Figure 16 is based on the same data. It shows MY 2006 vehicle sales by percentage for each country of origin.

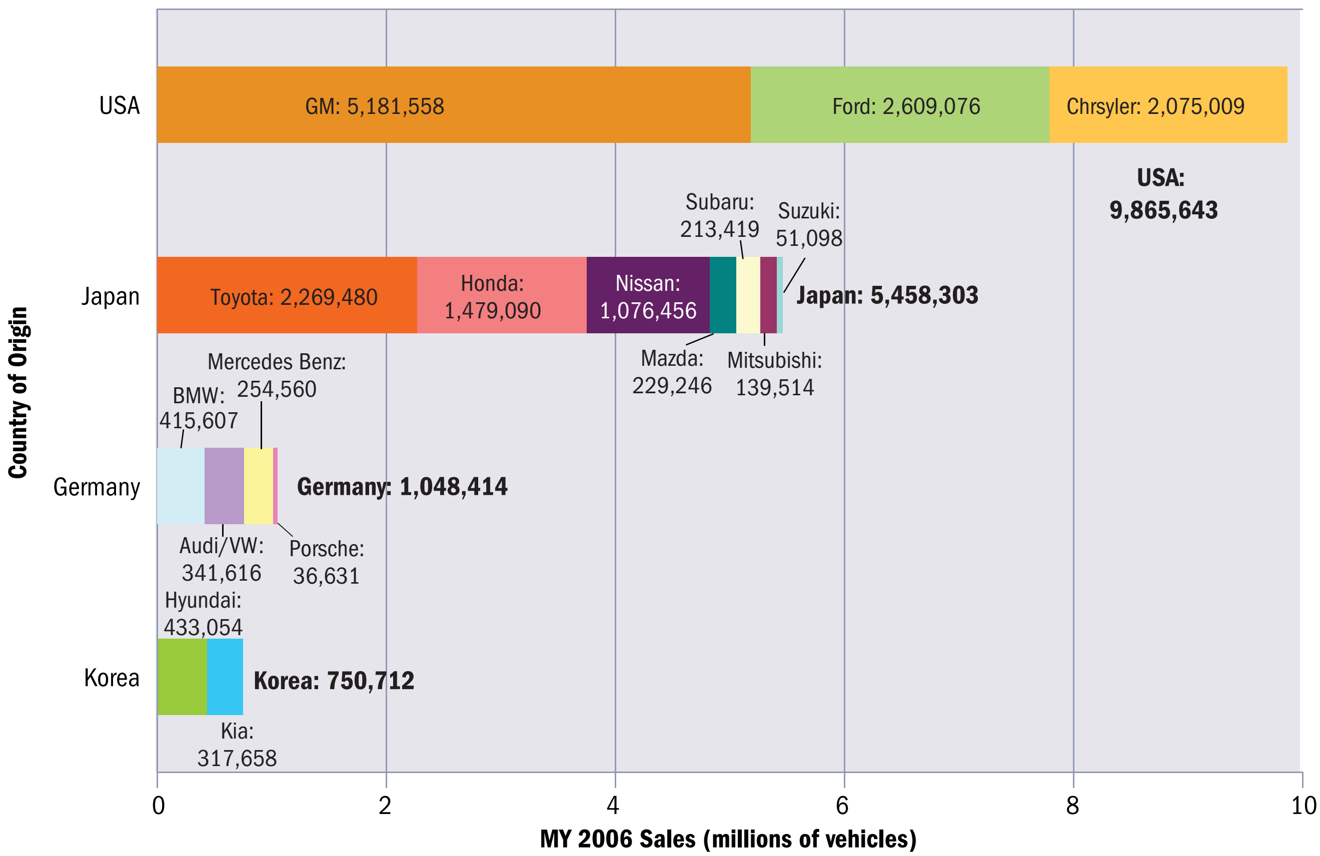


Figure 14. MY 2006 Car and Light Truck Sales by Manufacturer for the United States, Japan, Germany, and Korea

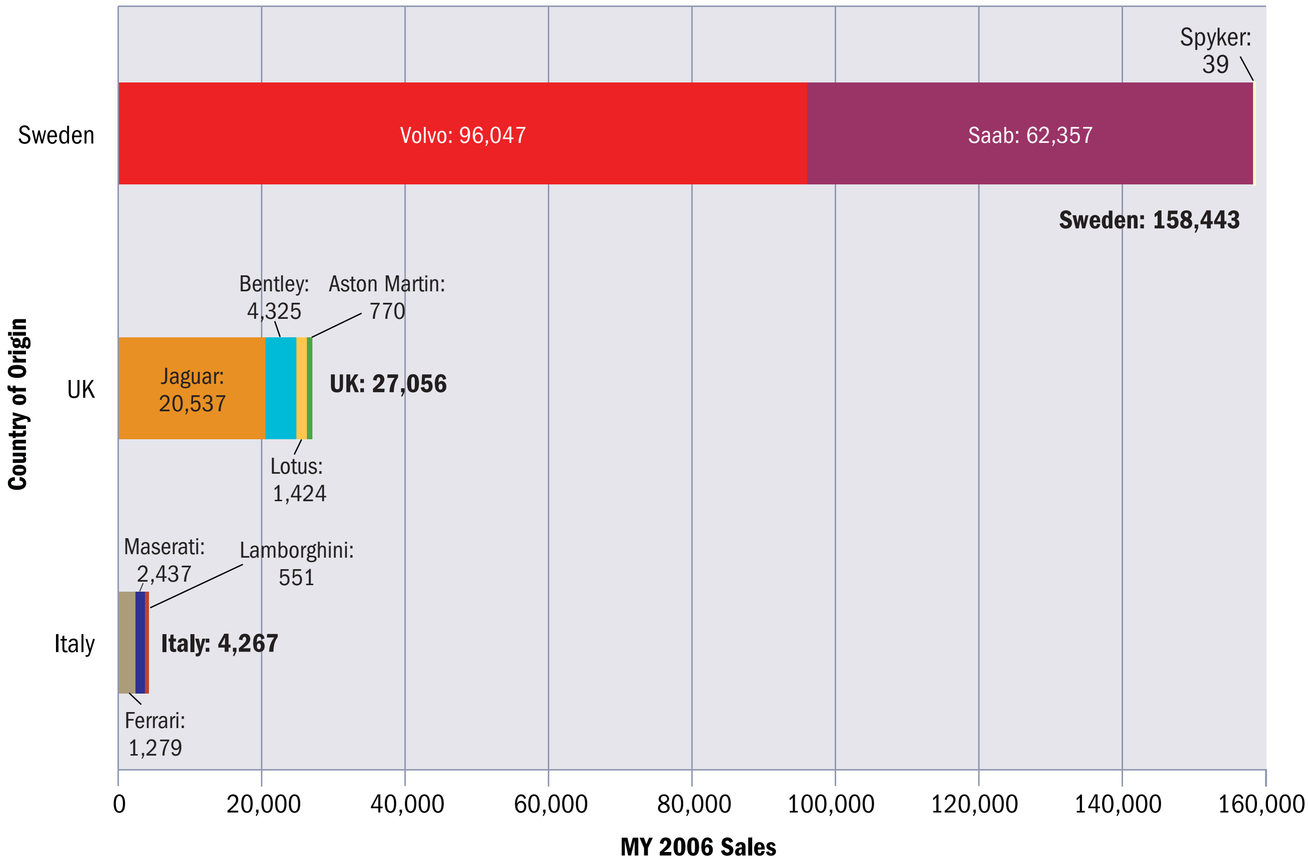


Figure 15. MY 2006 Car and Light Truck Sales by Manufacturer for Sweden, the United Kingdom, and Italy

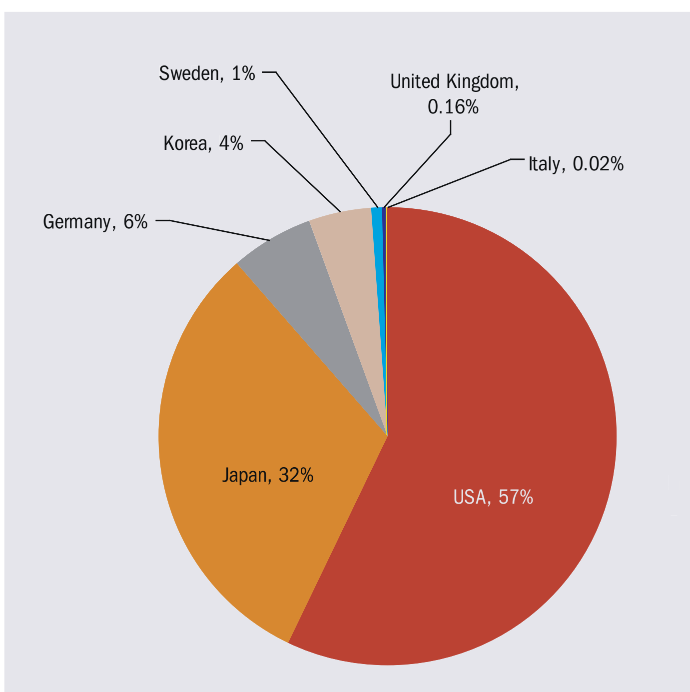


Figure 16. MY 2006 Car and Light Truck Sales by Country of Origin

Figures 17 through 23 show the manufacturing location of heavy-duty and nonroad engine categories sold under a MY 2007 U.S. Certificate of Conformity. Engines produced in more than one country were aggregated under "multiple countries," as designated by the manufacturer. This approach might not completely capture existing corporate and financial relationships.

EPA tracks manufacturing location because the supply base of engines for the various heavy-duty and nonroad sectors is quite diverse. Manufacturers from across Europe and Asia provide engines used in machines sold for use in the United States. As such, it is important to realize that a compliance presence might need to be established outside of the United States. This may include reviewing facility testing and calibration records and conducting emission performance audits of current production.

For MY 2007, all locomotive engines and 99 percent of locomotives were produced in the United States. The remaining models were produced in Canada.

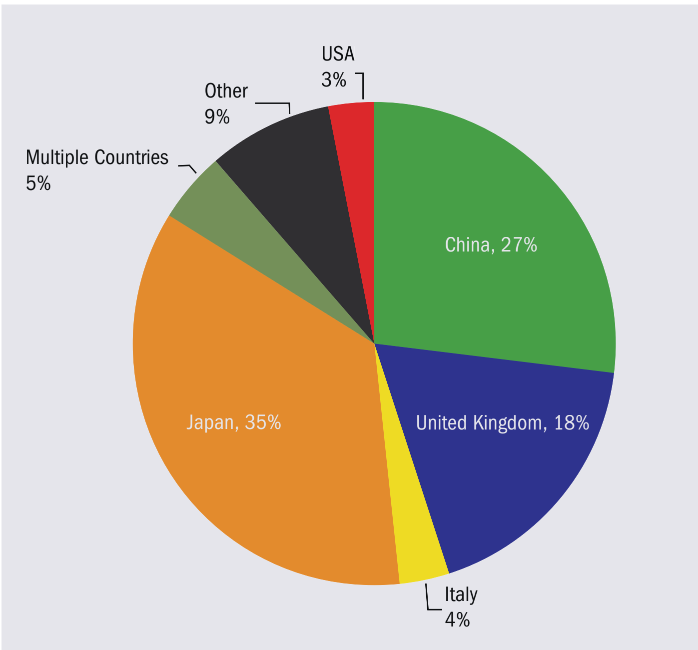


Figure 17. Production of Agricultural and Construction Equipment Engines by Manufacturing Location

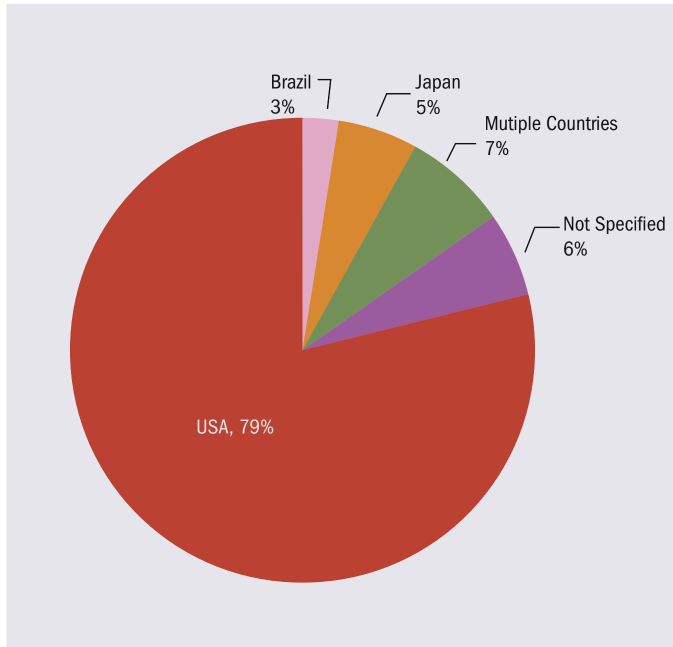


Figure 18. Production of Semi-Trucks and Buses by Manufacturing Location

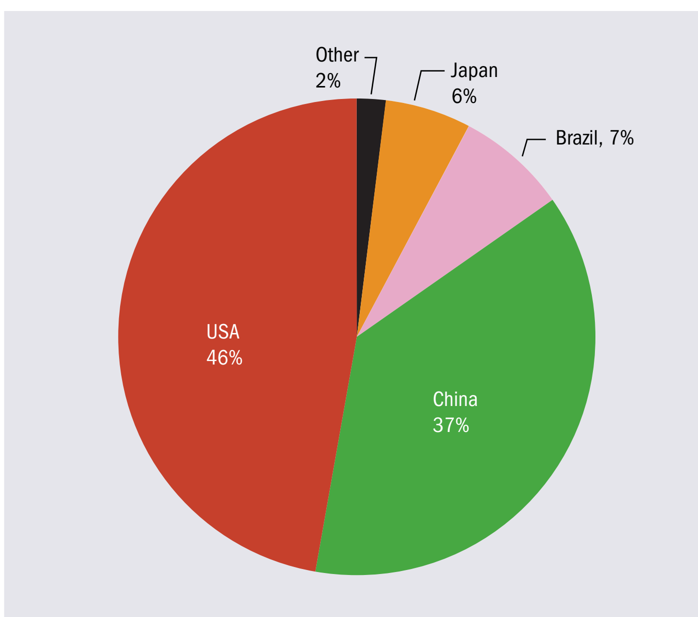


Figure 19. Production of Lawn and Garden Equipment Engines by Manufacturing Location

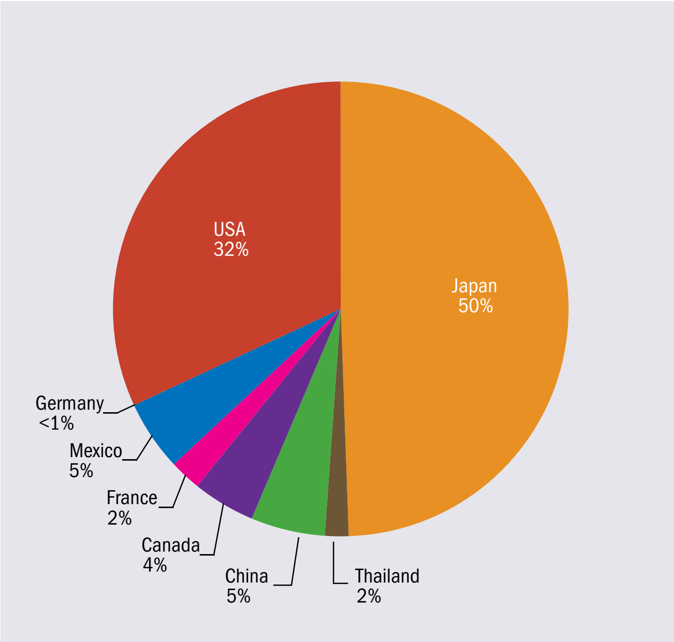


Figure 20. Production of Gasoline Boat and Personal Watercraft Engines by Manufacturing Location

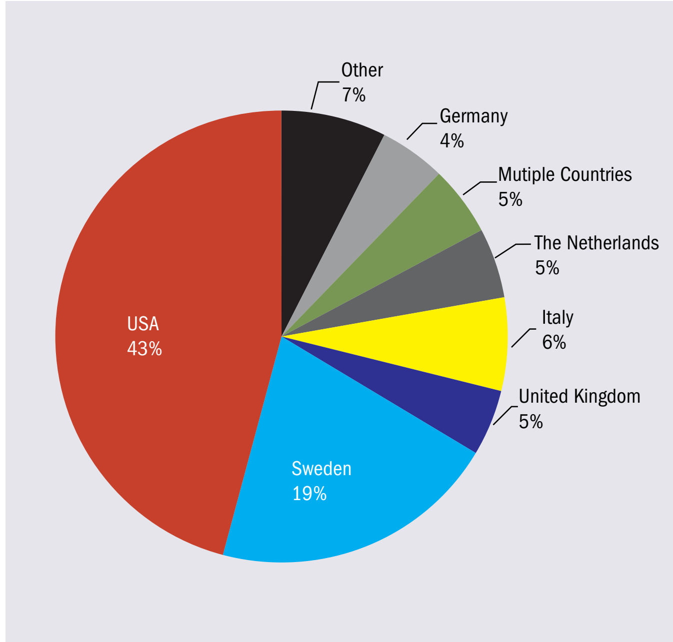


Figure 21. Production of Diesel Boat, Ship, and Oceangoing Vessel Engines (Both Commercial and Recreational) by Manufacturing Location

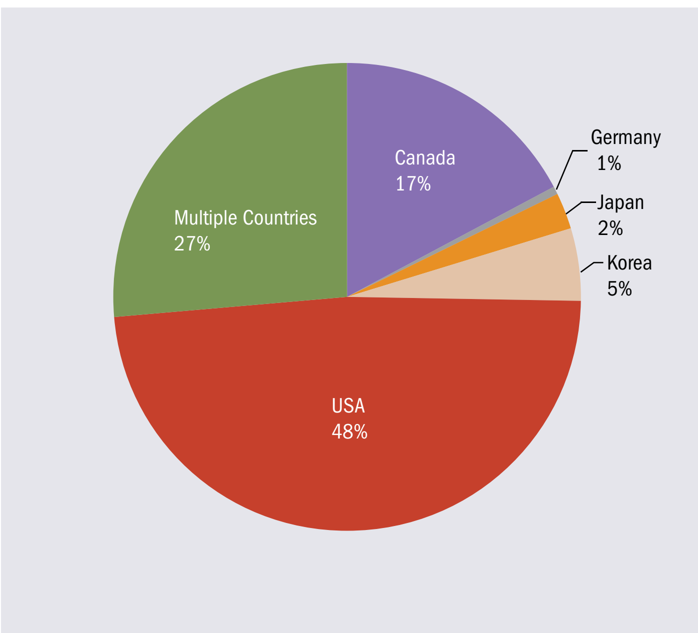


Figure 22. Production of Forklift, Generator, and Compressor Engines by Manufacturing Location

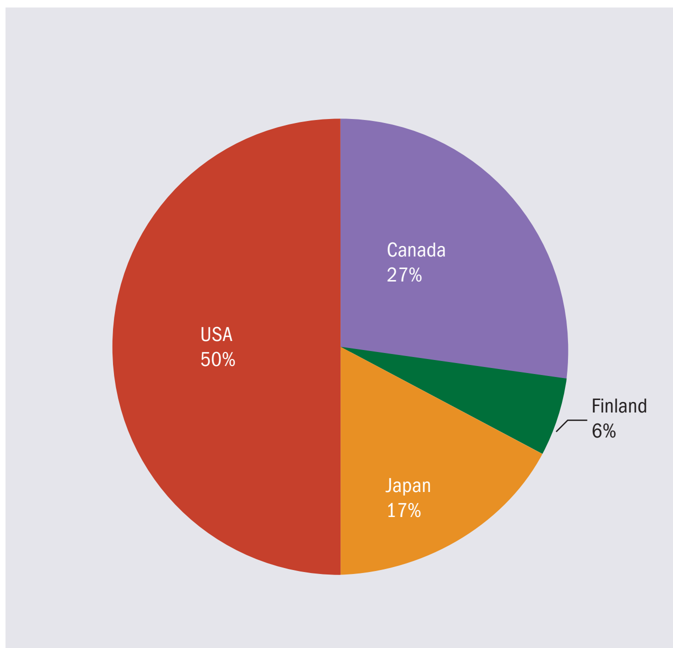


Figure 23. Production of Snowmobiles by Manufacturing Location

b. Alternative and Diesel Fuel Vehicles

b.1 Alternative Fuel Vehicles Produced by Original Equipment Manufacturers

Figure 24, below, presents the number of MY 2007 test groups of alternative and diesel fuel vehicles for each manufacturer. All MY 2007 ethanol vehicles are flex-fuel vehicles, capable of operating on gasoline, E85 (85 percent ethanol and 15 percent gasoline), or an intermediate blend. Note that the number of test groups certified does not necessarily reflect the number of vehicles produced. Thus, manufacturers with the most certified diesel test groups may not have produced the most diesel vehicles.

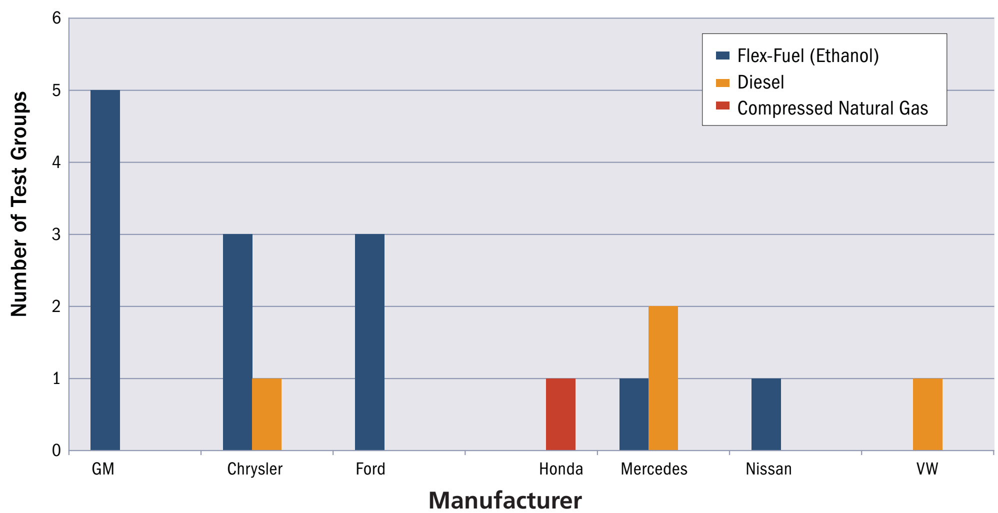


Figure 24. Alternative Fuel Car and Light Truck Test Groups by Original Equipment Manufacturer

For comparison, Figure 25 below shows the sales of MY 2006 vehicles by fuel type. The vast majority of vehicles still run on gasoline only. About 5 percent of MY 2006 vehicles sold are flex-fuel vehicles capable of operating on either E85 or gasoline. Following gasoline and ethanol, diesel is the next most prevalent fuel. Compressed natural gas (CNG) vehicles make up only 0.002 percent of MY 2006 vehicle sales.

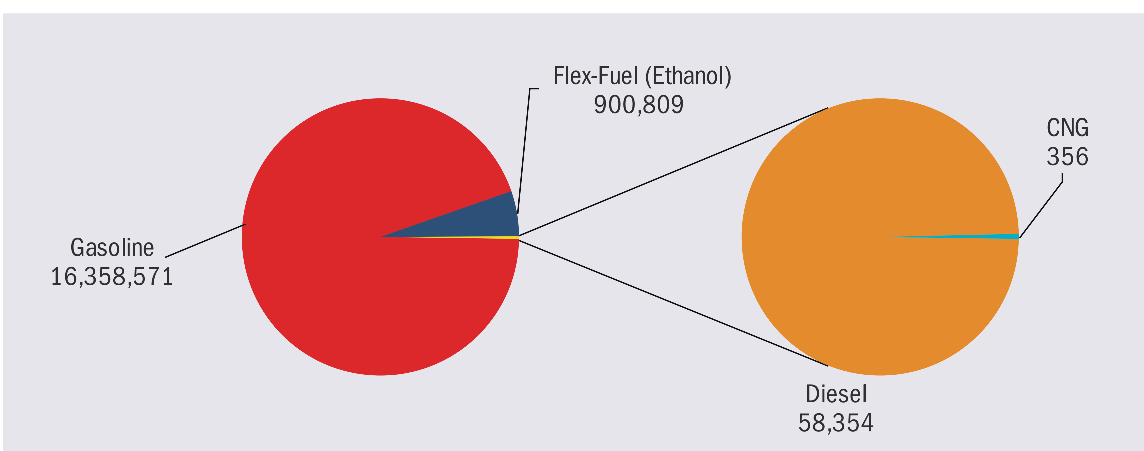


Figure 25. MY 2006 Car and Light Truck Sales by Fuel Type

b.2 Alternative Fuel Vehicles Produced by Alternative Fuel Vehicle Converters

Some alternative fuel vehicles are gasoline vehicles that have been converted to operate on alternative fuels. The CAA requires certification for all vehicles, inlcuding those modified from their original configuration to use alternative fuels, such as CNG or liquified natural gas. Alternative fuel converters are responsible for obtaining a certificate and for ensuring that converted vehicles remain in compliance with all EPA regulations.

Manufacturers built approximately 750 light-duty alternative fuel conversions in 2007. Table 6 below summarizes certificates issued for light-duty vehicle fuel conversions by manufacturer.

Table 6. Alternative Fuel Conversions

Fuel	Total Certificates Issued in MY 2007	Manufacturer
Cars and Light Trucks		
CNG	2	BAF Technologies
Dual Fuel[1] (CNG/Gasoline)	10	ECO Fuel Systems
		Parnell
Liquified Petroleum Gas (LPG) Dedicated	12	AFV Solutions
		Parnell
		Yellow Checker Star
Dual Fuel[1] (LPG/Gasoline)	12	AFV Solutions
		EDPRO
		Parnell USA
		Prins
Semi-Truck and Bus Engines		
Dual Fuel[1] (CNG/Gasoline)	3	Baytech
Dual Fuel[1] (Propane/Gasoline)	5	Baytech
		American Alternative Fuels
Propane	11	BAF Technologies
		Baytech
		Bi-Phase Technologies
		Clean Fuel USA
		Cummins
		Parnell USA
Natural Gas	12	Baytech
		Cummins
		John Deere Power Systems of Deere and Company
Forklifts, Generators, and Compressor Engines		
LPG	4	Linde Material Handling
		NGVI
Dual Fuel[1] (LPG/Gasoline)	23	Buck's Engines
		Engine Distributors
		Impco Technologies
		KEM Equipment
		NGVI
		Nissan
		Toyota Industrial Equipment Manufacturing
		Wisconsin Motors

[1] Dual fuel signifies a vehicle or piece of equipment capable of operating on two separate fuels, with separate fuel tanks. In operation, only one fuel is used at a time.

3. Compliance Testing

All of EPA's emission regulations specify test procedures to measure engine or vehicle emission levels. EPA uses the test results to determine compliance with the applicable emission standards. The number and types of tests vary according to the regulated sector. Certification testing is a form of compliance testing that is required as a condition of certification and is generally performed prior to issuing a certificate. In-use testing occurs after the vehicles or engines have been certified, generally on privately used vehicles or engines. Production line (or assembly line) testing audits emission levels of vehicles or engines that are in production, but not yet in service, to confirm that the manufacturer is building compliant vehicles.

a. Car and Light Truck Compliance Testing

Table 7 below lists the emissions tests that EPA requires for light-duty vehicles. These tests are used to measure compliance with CAA emission standards, Department of Transportation corporate average fuel economy (CAFE) standards, and consumer fuel economy labeling requirements. There are two components to car and light truck certification testing. The first component is initial testing that manufacturers conduct to support their application for a certificate of conformity. Manufacturers must conduct this testing for all test groups they wish to certify and must report the results to EPA as part of the certification application. The second component is confirmatory testing, which occurs after an application has been submitted. Confirmatory tests are performed by either the manufacturer or by EPA and serve to validate the manufacturer's initial emissions or fuel economy test results. EPA does not confirmatory-test all test groups but rather uses random and targeted methods to select vehicles for confirmatory testing. The confirmatory test rate in 2007 was 15 percent of all test groups.

Table 7. EPA/Manufacturer Light-Duty Test Procedures

Test Procedure	Manufacturer Testing for Certification Demonstration	EPA Confirmatory Testing
Federal Test Procedure (FTP)	●	●
Highway Fuel Economy Test	●	●
US06 (High Speed/Acceleration Cycle)	●	●
SC03 (Air Conditioning Test Cycle)	●	
Cold CO (FTP conducted at 20° F)	●	
Evaporative Emissions	● (3-day test)	● (2-day test)
ORVR	●	
Running Loss Emissions Test	●	

Figure 26 presents results of EPA's MY 2007 confirmatory test program. The graph shows the number and percent of passes and failures over the FTP, highway cycle, US06 cycle, and evaporative emissions test. The FTP test has the highest rate of failure, followed by the US06 test. Both the evaporative and highway tests have relatively low rates of failure. The total number of tests conducted over each test cycle differs because FTP and highway tests are required for both emissions and fuel economy purposes, whereas US06 and evaporative emissions testing are required for emissions only. The number of evaporative tests performed by EPA is low compared to the number of exhaust tests because manufacturers usually have far fewer evaporative families than exhaust test groups.

The pie chart in Figure 26 shows FTP failures by pollutant. The greatest number of failures were for non-methane organic gas (NMOG) exceedances, followed by NO_x and CO.

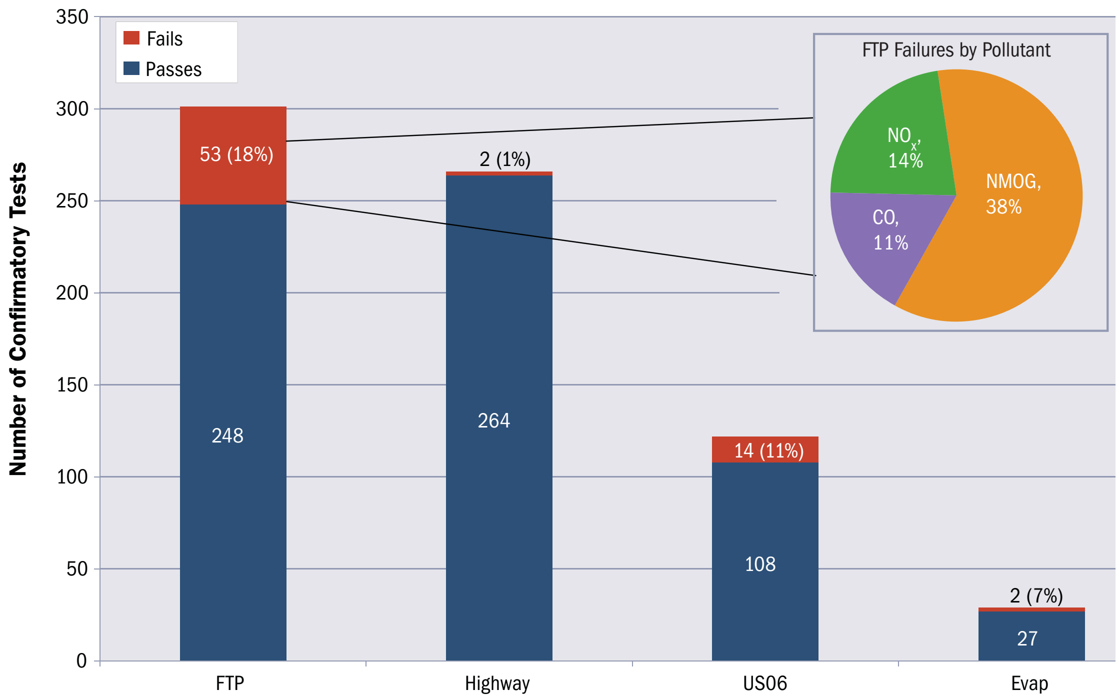


Figure 26. MY 2007 Confirmatory Testing Passes and Failures by Exhaust Emissions

For 2007, 26 confirmatory tests failed. Of these failures, six resulted in calibration changes. Table 8 illustrates the confirmatory test failures that required some type of calibration change to the vehicle. This is significant because it illustrates that even for a very mature emission control program like the one for light-duty vehicles, pre-production mistakes can still happen. These mistakes would result in emission exceedences if not resolved prior to introduction into commerce.

Table 8. Confirmatory Test Failures Requiring Vehicle Calibration Change, 2007			
Manufacturer	**Test Group**	**Model(s)**	**Emission Failed**
GM	7GMXV03.8044	Chevrolet Impala, Monte Carlo, Pontiac Grand Prix, Buick La-crosse/Allure, Lucerne	NMOG
Hyundai	7HYXV01.6MW5	Sonata	NMOG
GM Daewoo	7GDXV01.6D04	Chevrolet Aveo, Aveo 5, Suzuki Swift, Swift+, Pontiac Wave, Wave 5	NMOG
GM	7GMXT03.6150	XL-7	NO_x, NMOG
Saleen	7S3XT05.4HDA	Saleen F-150	CO
Land Rover	7LRXT04.2001	Range Rover	NMOG

As mentioned previously, EPA performs tests for both emissions and fuel economy validation purposes. While the Agency does not regulate carbon dioxide (CO_2) emissions at this time, CO_2 is a major greenhouse gas contributing to climate change, and CO_2 emission rates correlate directly to fuel economy. Figure 27 compares the average CO_2 emissions among manufacturer car and truck fleets and presents the corresponding miles per gallon (mpg). The CO_2 average was determined using the sales-weighted highway and city fuel economy numbers as measured in the laboratory. Consumer fuel economy label values include an adjustment factor to reflect differences between real world and laboratory driving conditions. The unadjusted averages presented below will therefore reflect lower CO_2 and higher mpg levels than would be expected in real world driving conditions. Generally, for gasoline vehicles, a CO_2 emission level of 300 grams per mile is equivalent to roughly 30 mpg. A CO_2 emission level of 400 grams per mile is equivalent to approximately 22 mpg.

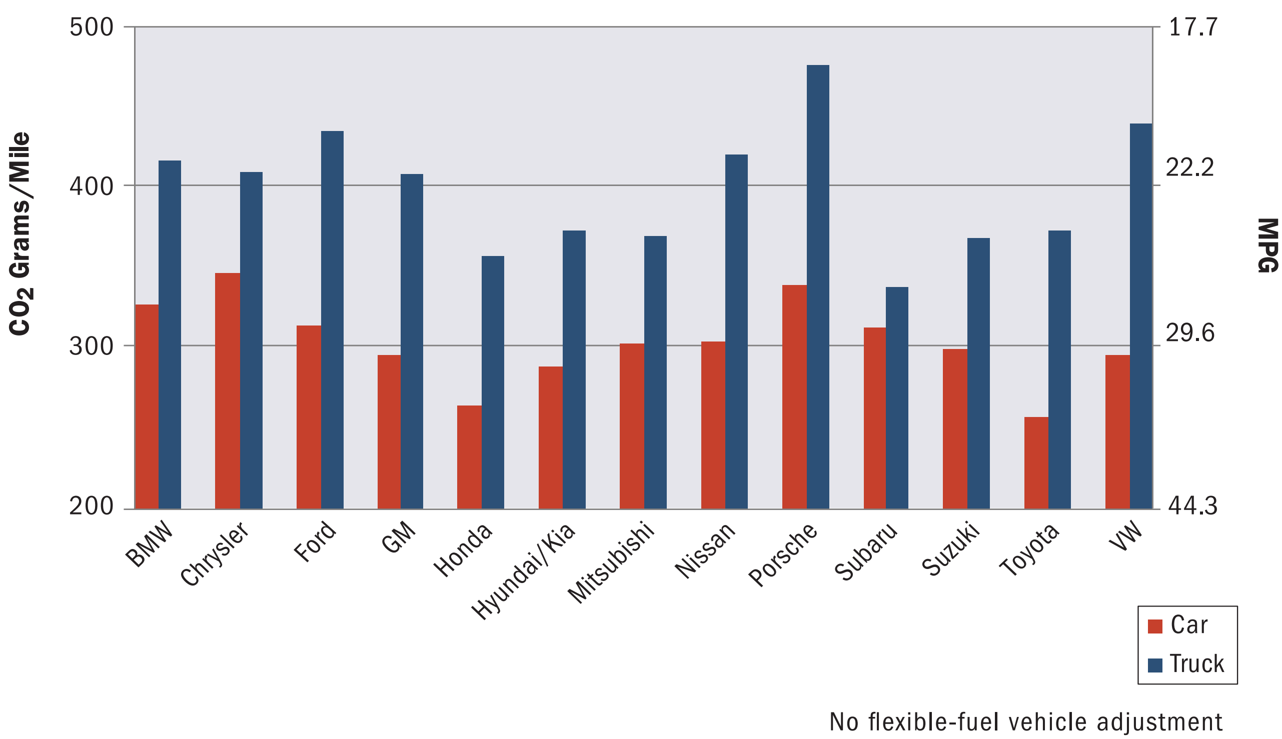


Figure 27. Average CO_2 Emissions and MPG per Vehicle, 2007

b. Heavy-Duty Highway and Nonroad Engines Confirmatory Testing

Confirmatory testing for heavy-duty highway and nonroad engines is similar to that for light-duty vehicles. EPA may conduct confirmatory and other testing on any test engine a manufacturer uses to demonstrate compliance for an engine family. EPA test results validate the manufacturer test results and subsequently become the official record used to determine compliance with emission standards.

EPA began confirmatory testing nonroad engines in 2006. Four MY 2007 agricultural and construction engine families were selected for testing from four different engine manufacturers. The results, displayed in Figures 28, 29, and 30, show that all companies complied with the emission standards. The data were generated from testing conducted by EPA at the National Vehicle and Fuel Emissions Laboratory and from original certification test data submitted by manufacturers. While the results demonstrate good comparability between EPA and manufacturer nonroad engine emissions testing, the manufacturer data sets in the figures do not necessarily represent data from the most recent manufacturer testing on the engines. For example, data from the manufacturers may be carry-over test data from previous model years, as permitted by the regulations.

EPA plans to expand confirmatory testing over the next couple of years to other nonroad engine categories, including lawn and garden equipment. Confirmatory testing of semi-truck and bus engines is expected to begin in 2009.

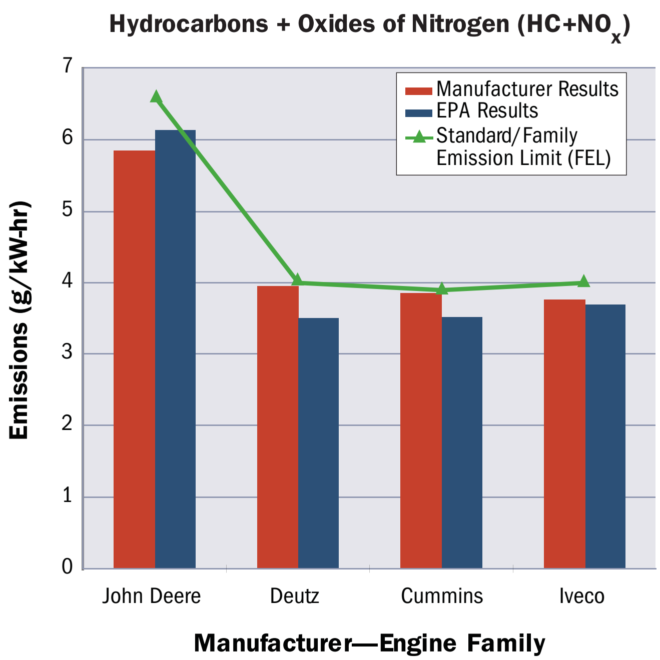


Figure 28. Comparison of EPA/Manufacturer MY 2007 HC and NO_x Emission Results

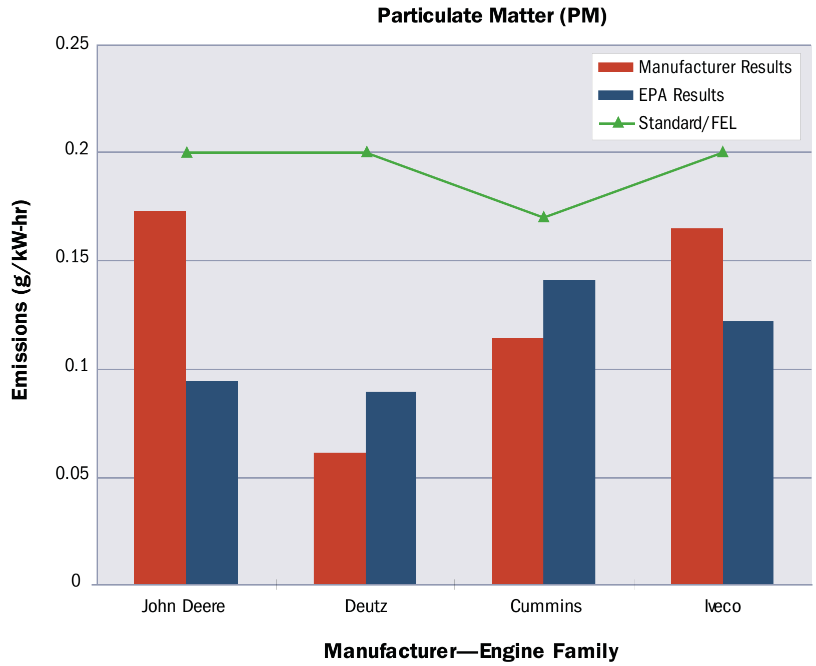


Figure 29. Comparison of EPA/Manufacturer MY 2007 PM Emission Results

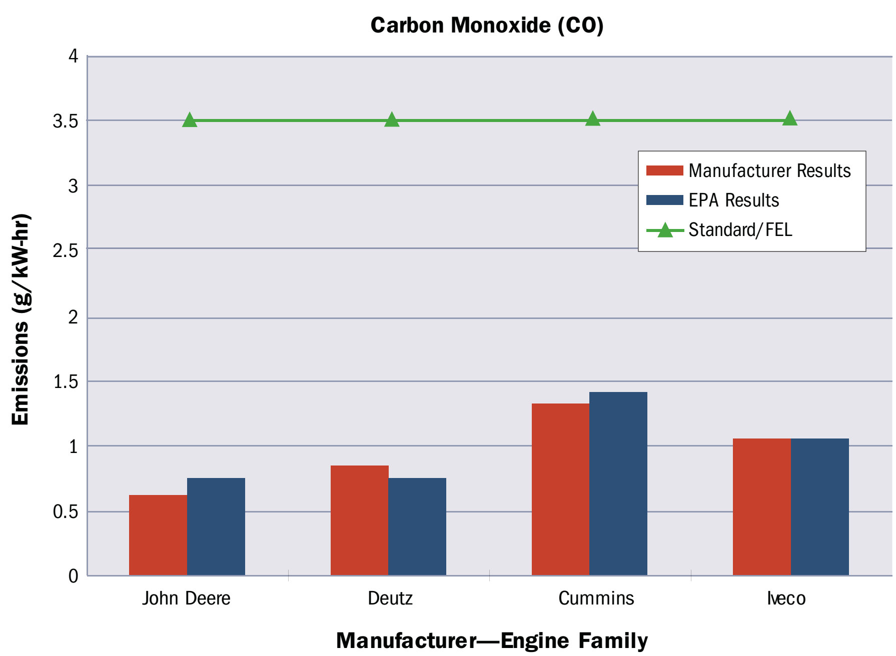


Figure 30. Comparison of EPA/Manufacturer MY 2007 CO Emission Results

4. Additional Compliance Requirements—Production Line Testing and Selective Enforcement Audits

Production line testing requires manufacturers to routinely test engines as they leave the assembly line to demonstrate that production engines control emissions at least as well as the prototype engines tested for certification. Production line testing is currently used primarily for nonroad engines.

Selective enforcement audits require manufacturers to test engines pulled off the production line without prior notice. EPA has used selective enforcement audits as a backstop measure if a problem is suspected with routine production line testing (e.g., possible reporting fraud, or improper testing procedures). In the future, the use of this tool will be increased as industry in various sectors transitions to technologies that result in emissions reductions below previous standards, or in instances where sectors may have a higher percentage of new, possibly inexperienced entrants into the market.

B. Vehicle and Engine In-Use Compliance

1. Light-Duty Vehicle In-Use Testing

a. In-Use Testing Conducted by EPA

EPA conducts a surveillance program at its Ann Arbor laboratory to assess emissions a few years after vehicles enter customer service. EPA typically recruits two- or three-year old vehicles from vehicle owners in southeast Michigan for this program. These vehicles are chosen for a variety of reasons, ranging from issues of past emissions performance to gaining a better understanding of how new technologies are working.

In 2007, EPA tested 142 vehicles, representing 47 test classes, as shown in Table 9. Vehicles are listed by manufacturer, vehicle model, and model year.

A test class is a group of vehicles with very similar design characteristics from an emissions standpoint. EPA usually tests three randomly selected vehicles within each selected test class. During 2007, nine vehicles, covering five test classes, failed one or more emissions standard. However, only one of these test classes exhibited failures to the extent that it required further investigation by EPA.

Table 9. In-Use Surveillance Testing of Cars and Light Trucks, 2007

MY	Manufacturer	Model
2004	Toyota	Scion (1.5L)
	BMW	Mini Cooper
	GM	Chevy Cavalier, Truck 5.3L/6.0L
	Suzuki	Aerio
2005	BMW	325i
	Chrysler	Dodge Magnum, Jeep Liberty, Ram 1500, PT Cruiser Turbo
	Ford	Crown Victoria, 500, F-150, Ford Escape 2WD, Lincoln LS, Mercury Mariner 2WD, Ranger
	GM	Cadillac CTS and STS, Chevy Impala, Chevy Pickup, Hummer, Saturn, Cobalt
	GM Daewoo	Suzuki Forenza
	Honda	Accord, Element
	Hyundai	Tucson, XG350
	Jaguar	X-type
	Kia	Rio, Sorento SUV
	Mazda	MPV
	Mercedes-Benz	CLK500, CLK 500, Cabriolet
	Mitsubishi	Eclipse, Endeavor, Gallant
	Nissan	Altima, Murano, 350Z
	Porsche	Cayenne
	Subaru (Fuji)	Forester AWD
	Suzuki	Grand Vitara
	Toyota	Avalon, RAV-4, Tacoma
	Volvo	S-40 and S-60
	VW	Beetle, Diesel Golf, Jetta
2006	Hyundai	Sonata

b. In-Use Testing Conducted by Manufacturers

Since 2004, passenger car and light truck manufacturers have also been required to conduct their own in-use testing program, known as the In-Use Verification Program (IUVP). Manufacturers recruit IUVP vehicles from private citizens across the United States. The vehicles are minimally screened for safety or obvious tampering. The IUVP tests are required at low mileage (10,000 miles) and high mileage (50,000 miles). Manufacturers must report their IUVP data to EPA on a pre-determined schedule. In addition, if any manufacturer's failure rates for a particular test group surpass the threshold established in the regulations, that manufacturer must automatically conduct an In-Use Confirmatory Test Program (IUCP) on the test group that has failed. Depending on the results of the IUCP testing, manufacturers might need to recall or implement other remedies for the failing test groups. In 2007, one manufacturer was required to conduct an IUCP. This IUCP resulted in a voluntary recall of BMW vehicles.

IUVP is yielding significant information about how light-duty vehicles are performing in use. The data allow EPA to work with manufacturers to identify potential design issues for future model years and target vehicles that might need additional attention. Table 10 shows the testing and failure rates for all of the IUVP testing as of December 31, 2007. The high-mileage data cover approximately 75 percent of MY 2003 testing. MY 2003 testing will be complete five years from the end of production (expected August 2008). Test data for MY 2004 high-mileage vehicles were not included because manufacturers were just beginning to test these vehicles at the time of publication of this report.

Similarly, the latest low-mileage IUVP data cover approximately 95 percent of MY 2006 testing. MY 2006 testing will be complete two years from the end of production (expected August 2008). Model year 2007 test data are not included because manufacturers were just beginning to test these vehicles.

Overall, the test results from this program show that the in-use fleet is performing well. If either the high- or low-mileage testing program reveals problems, EPA works with the manufacturer to fix the problem. This occurs either though voluntary manufacturer action or, if necessary, through an ordered emissions recall, described in greater detail on page 36.

Table 10. In-Use Verification Program Results

Model Year	FTP		US06		2-Day Evap		ORVR	
	Vehicles Tested	Percent Fail	Vehicles Tested	Percent Fail	Vehicles Tested	Percent Fail	Vehicles Tested	Percent Fail
High-Mileage Testing								
2000	478	6.5	0	0	43	0	22	9.1
2001	1146	4.7	18	5.6	104	3.8	78	6.4
2002	1121	5.1	95	5.3	108	2.8	75	9.3
2003	599	4.2	123	2.4	62	3.2	49	10.2
Low-Mileage Testing								
2004	662	5.4	618	1.3	167	7.2	150	8.0
2005	651	5.7	584	0.9	152	5.9	142	6.3
2006	625	4.6	541	0.9	139	3.6	138	5.8
2007	32	0	29	0	12	0	13	0

* Unrounded emission values exceeded the emission standard, including void tests.

2. Heavy-Duty Highway and Nonroad In-Use Testing

As it does for light-duty vehicles, in-use testing for the heavy-duty and nonroad sectors provides an essential measure of compliance with emission standards. Similar to the light-duty program, both EPA and manufacturers conduct testing to check in-use emission levels. Test program design varies depending on issues specific to each sector, as described in the following section.

a. EPA In-Use Testing

EPA's in-use heavy-duty and nonroad emissions testing program is new compared to the long-standing light-duty in-use program. This is because the emission standards for these sectors only recently became stringent enough to require controls that might be affected by factors such as deterioration or engine control design strategy that could change emissions in use. Consequently, EPA had multiple goals for its 2007 heavy-duty and nonroad in-use test program. These included collecting data to characterize emissions under various operating conditions, identifying potentially noncompliant engine families, demonstrating new test methods, and gaining experience with new tools and equipment.

EPA tests in-use heavy-duty highway and nonroad engines using portable emissions measurement systems (PEMS). These systems can measure emissions in real time, under the same conditions that vehicles or equipment might experience in actual service. While not identical to laboratory measurement systems, this technology is appropriate for use as a testing tool. PEMS testing allows EPA to characterize emissions levels without having to remove the engine from a large vehicle and test it in a laboratory under simulated conditions. EPA conducts this testing at the U.S. Department of Defense Aberdeen Test Center in Maryland.

During 2007, EPA conducted 54 tests of late model year trucks and 72 late model year nonroad equipment tests. The diesel manufacturers whose products were tested include John Deere, Caterpillar, Case New Holland, Cummins, Mack, Volvo, International Navistar, Kubota, and Mercedes-Benz. The vehicles and equipment were procured from truck rental companies, state and local public works fleets, private companies, and other sources. Sample results of this testing can be seen in Figure 31, below. It is important to note that the emission standards and test methods in place for the model years we tested are not as stringent as they are for current model heavy-duty highway and nonroad engines.

Figure 31 presents a sample of highway heavy-duty "not-to-exceed" (NTE) NO_x levels, compared to the NTE NO_x standard. The NTE standard represents a maximum value for the entire in-use test. It is calculated by averaging second-by-second NO_x measurements into 30-second sets.

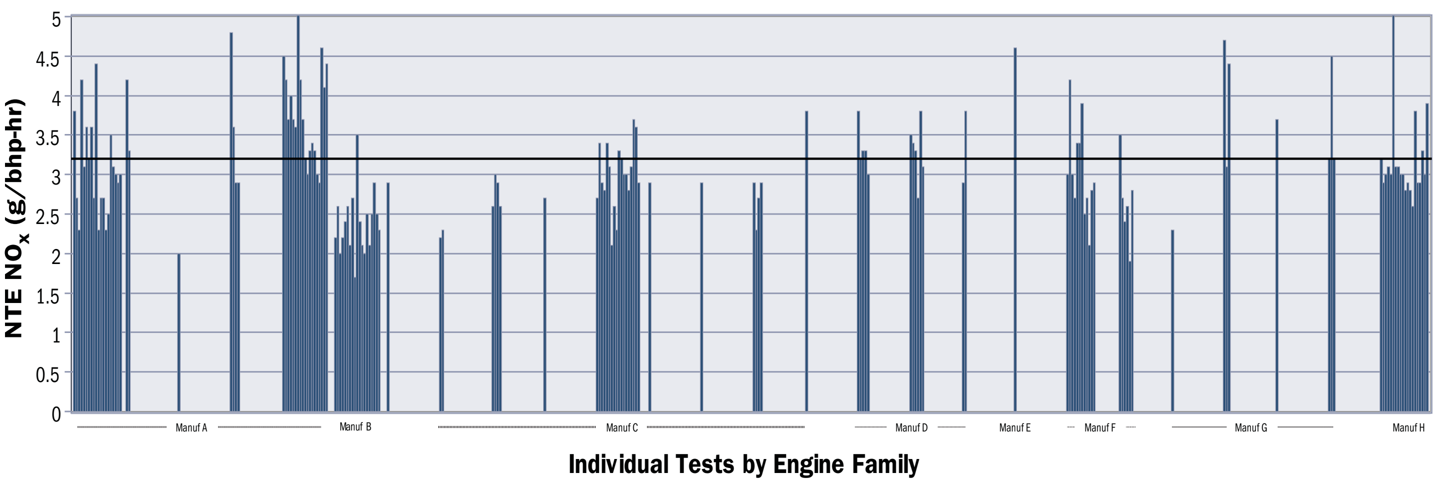


Figure 31. In-Use Test Results for 3.1 NTE NO_x Standards for Highway Vehicles, 2007

As it obtains results from in-use testing, EPA conducts an NTE review assessing the emissions that occur within the operating window of the NTE zone. Figure 31 represents the initial review by EPA engineers to determine areas where exceedances of emission limits may have occurred during operation of vehicles. Upon completion of this review, EPA discusses the findings with the manufacturers in question as part of the process of determining the cause of the emission exceedances. This aspect of the review of in-use testing focuses on encouraging compliance with EPA regulations during real-world operation of the vehicles. We continue to review and analyze the full set of data from our in-use testing program.

Table 11 offers another way of looking at the heavy-duty highway data by comparing emissions within the NTE zone limits to demonstrate the amount of time compliance was achieved versus the times when excursions above the NTE emission limit occurred. These data suggest good overall compliance with emission standards, during highway operation, despite some exceedances of the NTE standard.

Interpretation of heavy-duty highway and nonroad in-use emissions data represents a special challenge because of flexibilities built into the emission regulations. Depending on a manufacturer's overall compliance strategy, high emission levels during in-use testing do not always represent a violation or noncompliance. Additional investigation will be necessary to fully

Table 11. NTE Summary for a Subset of Heavy-Duty Highway Vehicles Tested in 2007

Model Year Group	Regulatory Class	Manufacturer	FEL	NTE Limit	Max NTE Observed	Time Above NTE Limit
1999–2002	MHD	Manuf A	4.35	5.43	5.69	0.01%
	MHD	Manuf B	4.07	5.08	6.54	39.78%
	MHD	Manuf C	3.50	4.38	6.41	7.24%
	MHD	Manuf C	3.50	4.38	3.61	0.00%
	MHD	Manuf C	3.50	4.38	5.12	2.27%
2003–2006	BUS	Manuf D	2.70	3.38	4.77	2.83%
	BUS	Manuf B	2.50	3.13	2.88	0.00%
	HHD	Manuf E	2.50	3.13	2.75	0.00%
	HHD	Manuf E	2.50	3.13	3.44	28.39%
	HHD	Manuf E	2.50	3.13	2.67	0.00%
	HHD	Manuf E	2.50	3.13	2.90	0.00%
	HHD	Manuf D	2.52	3.15	3.22	0.36%
	HHD	Manuf D	2.56	3.21	2.28	0.00%
	HHD	Manuf B	2.50	3.13	2.85	0.00%
	HHD	Manuf B	2.50	3.13	2.88	0.00%
	HHD	Manuf B	2.50	3.13	3.67	1.96%
	HHD	Manuf C	2.51	3.14	4.56	12.78%
	HHD	Manuf C	3.01	3.76	3.61	0.00%
	HHD	Manuf C	3.01	3.76	2.88	0.00%
	LHD	Manuf F	2.58	3.22	3.31	0.03%
	MHD	Manuf A	2.59	3.23	3.34	0.05%
	MHD	Manuf A	2.65	3.32	3.33	0.28%

Table 12. Revised Engine Family Designation and Reporting Schedules

Program	Designate Families		Report Due	
	Original	Revised	Original	Revised
2005 Gaseous Pilot*	06/2005	Unchanged	11/2006	11/2007
2006 Gaseous Pilot	06/2006	12/2006	11/2007	11/2008
2007 Gaseous Enforceable	06/2007	12/2007	11/2008	11/2009
2007 PM Pilot	06/2007	12/2007	11/2008	05/2010
2008 Gaseous Enforceable	06/2008	09/2008	11/2009	03/2010
2008 PM Pilot	06/2008	09/2008	11/2009	09/2010
2009 Gaseous Enforceable	06/2009	Unchanged	11/2010	04/2011
2009 PM Enforceable	06/2009	Unchanged	11/2010	04/2011
2010 Gaseous Enforceable**	06/2010	Unchanged	11/2011	Unchanged
2010 PM Enforceable**	06/2010	Unchanged	11/2011	Unchanged

* The 2005 Gaseous Pilot Program has been completed.

** For illustration only. The 2010 program dates are as originally promulgated.

understand the in-use results presented in this report. For example, some of the high NO_x levels may be due to factors such as allowable engine protection strategies that temporarily increase emissions. We are working with the manufacturers to understand the results and assess whether the measured in-use emission levels constitute noncompliance with standards. EPA will continue to analyze the data and pursue further investigatory testing in 2008.

This is also the first year EPA obtained data as a result of the manufacturer-run in-use testing program. The manufacturer-run program for heavy-duty on-road diesel vehicles was specifically designed to assess compliance with EPA's NTE standards using advanced PEMS, and was developed collaboratively between EPA, the California Air Resources Board, and the diesel engine manufacturers. As may be seen in Table 12 above, the first set of data reported to EPA by manufacturers was a result of the pilot phase of the program. Generally, EPA selects engine families for testing in June of a given year. For the most part, manufacturers are required to test 25 percent of their engine families in any given year, such that their entire fleet of families will be tested within four years. The implementation schedule for the manufacturer-run in-use program was revised earlier in 2008 as seen in Table 12. These data will provide EPA with an even broader assessment of the level of compliance of heavy duty vehicles with the NTE standard during actual operation as manufacturers test the fleet of vehicles on the road.

b. Manufacturer In-Use Testing

EPA regulations require some engine manufacturers to conduct in-use testing under the Agency's direction. For every model year, EPA selects engine families for in-use emission testing based on information provided in the certification application. Criteria for selection include compliance margins (the difference between actual emission levels and the FEL or standard), previous testing history, technology, and use of emission credits. EPA may also choose an engine family if there is reason to believe a problem may exist with the particular engine family or manufacturer.

As shown in Table 13, the in-use testing requirement currently applies to manufacturers of semi-trucks; buses; gasoline boats and personal watercraft; diesel boats, ships, and oceangoing vessels; locomotives; and locomotive remanufacturers.

Table 13. Snapshot of Heavy-Duty Highway and Nonroad Manufacturer-Run In-use Programs

Engine Category	Program in Place Since	Selection Requirement	EPA Must Approve Testing Plan/ Engine Selection	Sample Size per Engine Family	Age of Engines to Be Tested	Activity in or Before 2007
Semi-Trucks and Buses	2005	Up to 25% of each manufacturer's engine families	No	Varies	Any age provided vehicle has not exceeded useful life	2005: 11 test orders issued for 13 engine families MY 2003–MY 2005; 2007 results undergoing analysis
Gasoline Boats and Personal Watercraft	1998		No	Generally, no less than 4 engines	50% to 75% of useful life	MY 2006: 9 test orders issued for 19 engine families; results expected in 2008
Forklifts, Generators, and Compressors	2007		Yes	Generally 2 or 4, depending on the size of the engine family	At least 50% of useful life	N/A
Locomotives	2007	1 engine family and/or 1 remanufactured family per manufacturer	Yes	Generally, 2 locomotives	50% to 75% of useful life	MY 2006: 6 test orders issued for 9 engine families or remanufacturing kits; actual orders issued in 2007

3. Warranties, Defect Reporting, and Recalls

a. Light-duty Vehicles

a.1 Warranties

The CAA requires manufacturers to warranty certain emission control components on vehicles. These warranties protect vehicle owners from the cost of repairs for certain emission-related failures that result from defective parts or that cause the vehicle to exceed emission standards. The warranties and the parts that are covered are specified by regulation and can be found listed in the warranty booklet for any new vehicle.

There are two categories of parts covered by the defect and performance warranties. Major emission control components include catalytic converters, electronic control units, and onboard diagnostic devices, or computers. These components must be warranted for eight years or 80,000 miles, whichever comes first, from the date the vehicle enters into service. All other specified emission control components must be covered for at least two years or 24,000 miles, whichever comes first, from the date the vehicle enters into service.

a.2 Defect Reporting

Manufacturers are required to report emission-related defects to EPA. An emission-related defect is a defect in design, materials, or workmanship in a device, system, or assembly, as described in the approved application for certification. For highway sectors, including light-duty cars, trucks, and SUVs, heavy-duty semi-trucks and buses, and motorcycles, EPA regulations establish minimum numbers of confirmed defects that trigger defect information reporting requirements. Table 14 describes the defect information report categories for light-duty vehicles in 2007. These reports, which can include multiple model years of a given vehicle, covered defects affecting over 18 million cars, light trucks, and SUVs and, in some cases, multiple models of a given vehicle. Although manufacturers are required to report emission-related defects to the Agency if the regulatory trigger is met, an emission-related defect does not necessarily lead to an emission recall because not all defects in emission-related parts increase emissions. Manufacturers must report the defects even though they may not increase emission levels.

Table 14. Number of Light-Duty Defect Information Reports by Category

Defect Category	Number of Reports
OBD	42
Computer-Related (other than OBD)	38
Electrical, Mechanical, & Cooling Systems	27
Evaporative Emissions System	15
Fuel Tank Component	15
Intake/Exhaust Manifold	15
Monitoring/Measuring Sensor/System	15
Fuel Delivery Component	13
Evaporative Exhaust System	12
Ignition Component	9
Oxygen Sensor	9
Vehicle Emission Control Information Label	9
Catalyst Component/System	7
Exhaust Gas Recirculation System	4
Crankcase Ventilation Component/System	2
Hybrid Vehicle Component/System	1
Other	1
Total	**234**

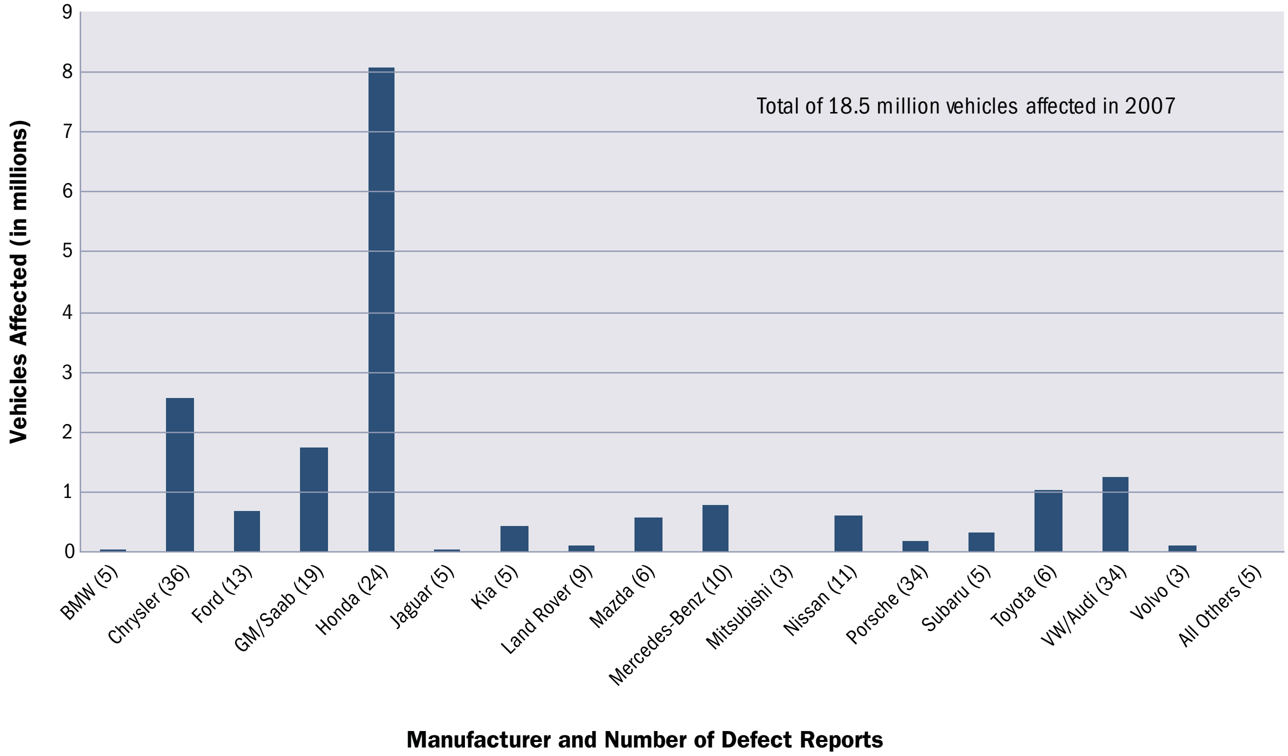


Figure 32. Defects, 2007

a.3 Recalls

Vehicle manufacturers are required to design and build their vehicles to meet emission standards for the useful life of the vehicle specified by law. Under Section 207 of the CAA, if EPA determines that a substantial number of vehicles in a class or category do not meet emission standards in actual use, even though they are properly maintained and used, EPA can require the manufacturer to recall and fix the affected vehicles. An emission recall is a repair, adjustment, or modification program conducted by a manufacturer to remedy an emission-related defect for which vehicle owners have been notified.

EPA has the authority to order a manufacturer to recall and fix noncomplying vehicles. However, most recalls are initiated voluntarily by manufacturers once a potential noncompliance is discovered. These voluntary actions could be influenced by the potential for EPA action. Some voluntary recalls are directly influenced via EPA in discussion with manufacturers. In 2007, more than 2.5 million cars and light trucks were affected by some type of voluntary emission-related recall. These recalls included several preceding model years. Figure 32 shows the total number of recalls and affected vehicles for MY 2007.

The range of problems for which vehicles can be recalled is shown in Figure 33. A significant number of the recalls performed in 2007 were to address possible vehicle emissions problems. Recalls were also performed in 2007 for:

1) Problems detected by the OBD system because of faulty components (e.g., oxygen sensor) and causing the malfunction indicator light (MIL) to illuminate
2) Defects of the OBD system itself, such as software update issues

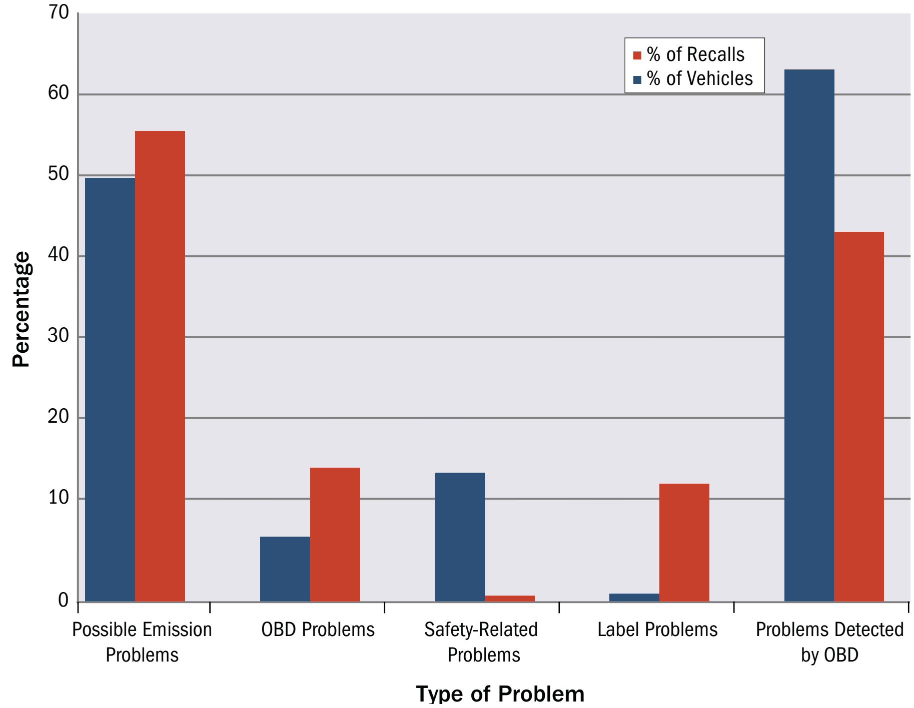


Figure 33. Types of Problems for Vehicles Recalled, 2007

Note: Because some recalls can fall into more than one category, the percentages can add up to more than 100 percent.

Description of types of vehicle recall problems:

- **Possible emissions problems—**defects that could cause emissions to increase
- **OBD problems—**defects of the OBD system such as software defects
- **Safety-related problems—**emissions-related defects that could also cause safety problems
- **Label problems—**incorrect Vehicle Emission Control Information labels
- **Problems detected by OBD—**defects that cause a MIL to be illuminated

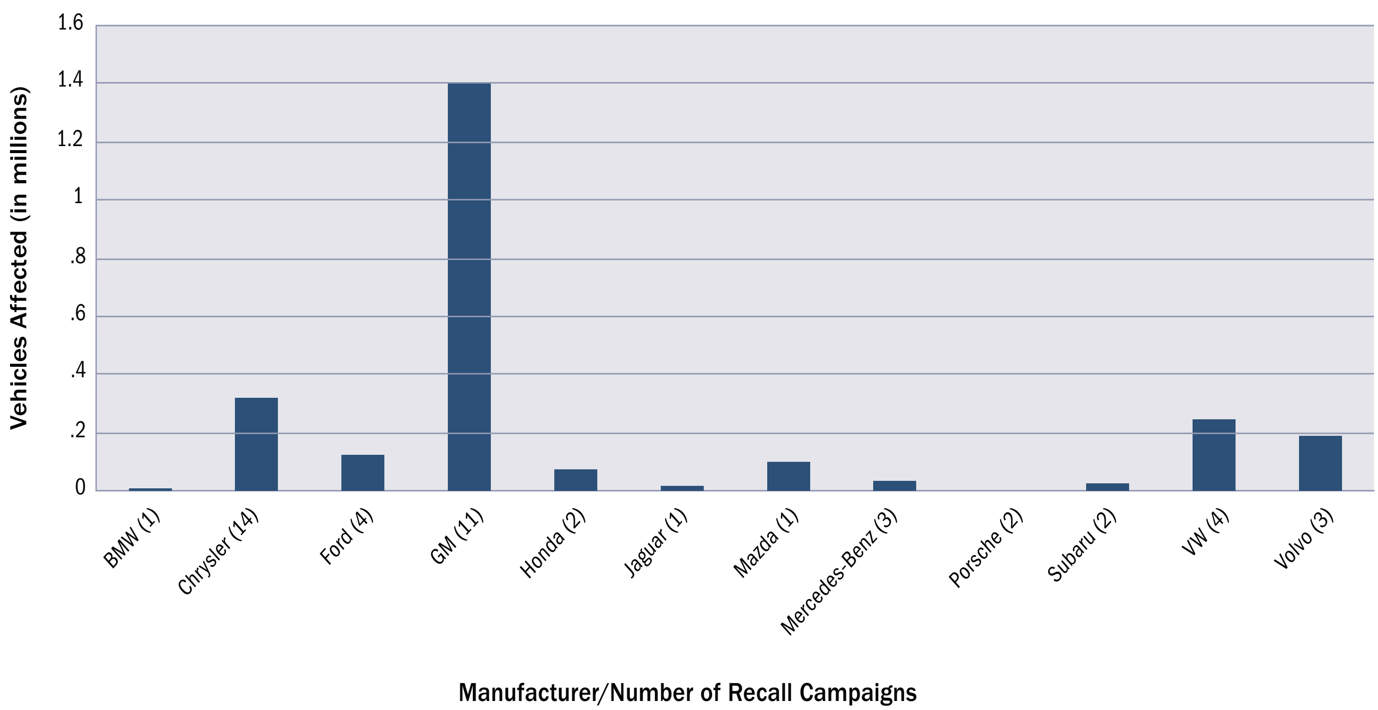


Figure 34. Car and Light Truck Recalls, 2007

b. Heavy-Duty and Nonroad Engines

b.1 Warranties

The CAA requirement for emission control warranties against defects in design, materials, and workmanship that cause vehicles to exceed federal emission standards extends to all heavy-duty and nonroad engines. Table 15 lists the different categories of heavy-duty and nonroad engines and their warranty coverage periods in effect for MY 2007.

Table 15. Warranty Coverage Period for Heavy-Duty and Nonroad Engines for Model Year 2007

Engine Category	Minimum Warranty Coverage Period*
Lawn and Garden Equipment	2 years, EPA may approve other periods under certain conditions
Agricultural and Construction Equipment	Between 1,500 hours/2 years and 3,000 hours/5 years, depending on engine rating and revolutions per minute
Diesel Boats, Ships, and Oceangoing Vessels	50%–100% of useful life, depending on category
Gasoline Boats and Personal Watercraft	2 years or 200 hours
Locomotives	30% of useful life
Semi-Trucks and Buses (Diesel)	5 years or 50,000 miles for light heavy duty engine, or 100,000 miles for medium heavy and heavy heavy engines
Semi-Trucks and Buses (Gasoline)	5 years or 50,000 miles
Recreational Vehicles	50% of useful life or 30 months
Forklifts, Generators, and Compressors	50% of useful life in hours of operation or 3 years

*Different coverage periods may apply to parts.

b.2 Defect Reporting

EPA regulations require manufacturers to monitor identified defects in the emission control systems of properly maintained and used engines. Manufacturers are required to notify EPA when they learn of the existence of emission-related defects in 25 or more highway engines (various thresholds apply to nonroad engine categories) of the same class and model year. The steps manufacturers must follow to investigate and report defects vary among different categories.

Heavy-duty and nonroad engine manufacturers have submitted 44 defect reports to date related to 2007 MY engines.

b.3 Recalls

EPA may order a recall when a defect that causes emissions to exceed the applicable emissions standards is identified. If a recall is needed, manufacturers may decide to conduct the recall voluntarily. For example, EPA received seven defect reports from snowmobile manufacturers in 2007, and six resulted in recalls. Four of these recalls were actually initiated in 2007 and involve seven different engine families. In all six cases, the snowmobile manufacturers decided to recall voluntarily. One personal watercraft and outboard manufacturer also conducted a voluntary recall in 2007.

V. Regulatory Flexibilities

EPA builds a great deal of flexibility into its emissions and fuel economy regulations. These flexibilities benefit the environment by enabling vehicle and engine manufacturers to introduce new technologies faster than would otherwise be possible under a "one-size-fits all" standard. Table 16 below describes typical flexibilities and the rules associated with those flexibilities.

Table 16. Regulatory Flexibilities

Flexibility	Description
Phase-in Schedules	Allow emission standards to be phased in with an increasing portion of the fleet each year
Averaging, Banking, and Trading (ABT)	Allows vehicle and engine manufacturers that overcomply with an average emission standard (e.g., Tier 2, Bin 5) to generate credits and either use them during a later compliance period or sell them to other manufacturers who produce vehicles and/or engines that do not meet the average standard
Transition Programs for Equipment Manufacturers (currently available for agricultural and construction equipment only)	Allows equipment manufacturers to introduce into commerce equipment powered by non-certified engines for up to seven years, contingent upon certain restrictions
Exemptions	Allow manufacturers and the public to import non-compliant engines for testing, display, or racing with certain restrictions
National Security Exemptions	Allow EPA to exempt engines used in armored vehicles or where compliance with emission standards interferes with critical performance
Hardship Relief	Allows engine manufacturers to request additional flexibilities when specific circumstances exist (e.g., economic hardship or natural disaster)
Small-Volume Manufacturer	Provides some relief from compliance requirements for small-volume manufacturers (10,000 vehicles per year or less)

A. Cars and Light Trucks

EPA's Tier 2 program for cars and light trucks exemplifies several flexibilities EPA regulations provide for vehicle manufacturers and fuel refiners. Among these flexibilities are a six-year phase-in of emission standards; emission standards based on a fleet average compliance level, with less stringent standards for the initial years of the program; and special phase-in conditions for diesel vehicles, etc. Manufacturers are also allowed to produce vehicles that overcomply with the average standard (e.g., Tier 2 Bin 5) to generate credits to be used during a later compliance period or sell them to other manufacturers that produce vehicles or engines that do not meet the average standard.

Figure 35 below shows actual Tier 2 phase-in percentages versus the required Tier 2 phase-in for MY 2004 through 2007. Manufacturers have been able to comply at higher phase-in percentages than required for each year of the phase-in.

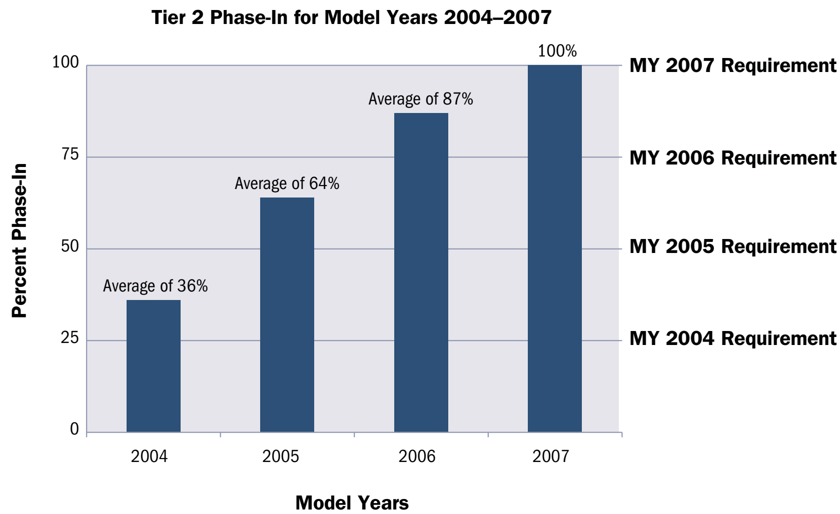


Figure 35. Tier 2 Phase-In Percentages

Out of approximately 40 vehicle manufacturers, five (Ford, Honda, Hyundai, Kia, and Toyota) had a positive Tier 2 emission limit credit balance for MY 2007, with one manufacturer (Aston Martin) having a small deficit or negative credit balance. The regulations allow three model years to reconcile any deficits. Manufacturers with credits have tended to certify the majority of their vehicles to the Tier 2 NO_x fleet average requirement of Bin 5 and the rest of their fleet to lower bins such as Bin 4 and Bin 3 that have more stringent emission standards. Figure 36 shows the percent of test groups per bin.The remaining manufacturers did not have any credits because they either certified all of their vehicles to Bin 5 or traded more stringent lower bin vehicles with less stringent higher bin vehicles such that they cancelled each other out, resulting in meeting the Tier 2 NO_x fleet average requirement of Bin 5 exactly.

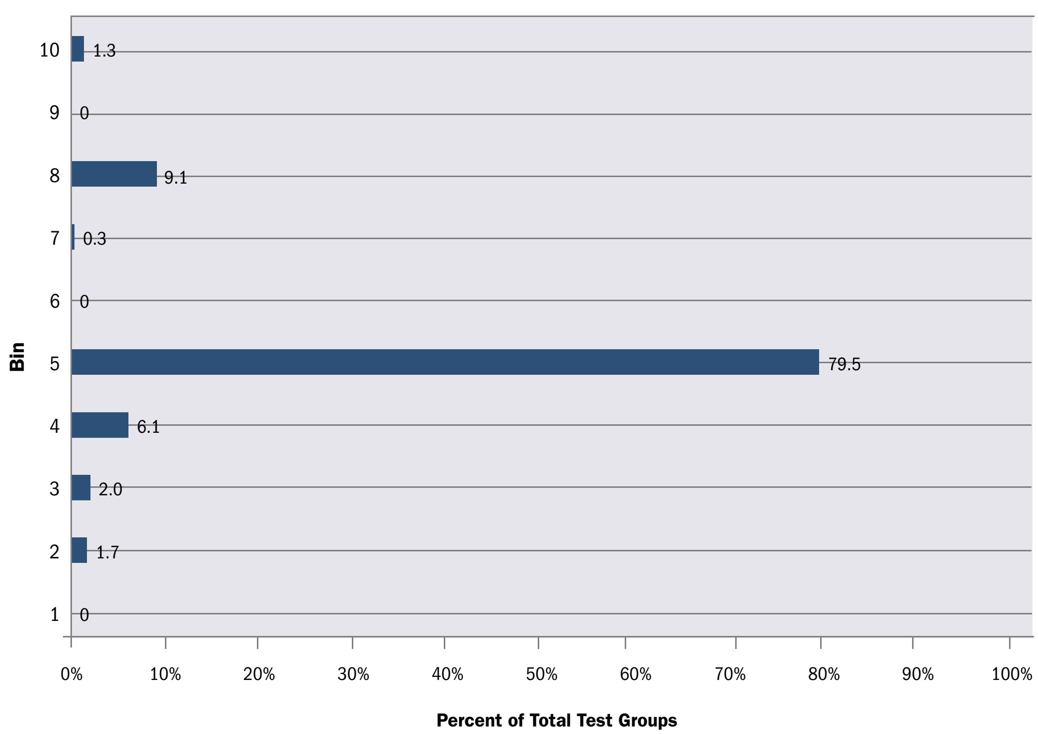


Figure 36. Percent of Total Test Groups per Bin

Despite the stringency of the Tier 2 standards, manufacturers have been able to comply. Manufacturers typically strive to design vehicles to overcomply with the standards. This is because vehicles have to comply with the emission standards for their useful lives (120,000 miles for light-duty vehicles) and manufacturers are subject to in-use testing requirements. There are a number of issues that can cause emissions to increase in-use, including component deterioration, component failures, and the stacking of component tolerances. To ensure that vehicles will comply for their useful lives and not have problems with in-use emission performance, manufacturers try to design their vehicles to emission levels well below the emission standards. The difference between the emission standard and a vehicle's actual certification emission levels is known as the "compliance margin."

Figure 37 shows the average compliance margins for the MY 2007 light-duty fleet for Tier 2 Bins 3, 5, and 8. These compliance margins range from 46 percent to 96 percent depending on the pollutant. Since the Tier 2 standards are based on a NO_x fleet average requirement equal to Bin 5, the big concern with the stringent Tier 2 emission standards was whether manufacturers would be able to maintain compliance margins similar to historical levels of 50 percent for past emission programs, such as Tier 0, Tier 1, and the national low emission vehicle program. As Figure 37 and the following figures illustrate, manufacturers have been able to well exceed their past performance with regard to compliance margins.

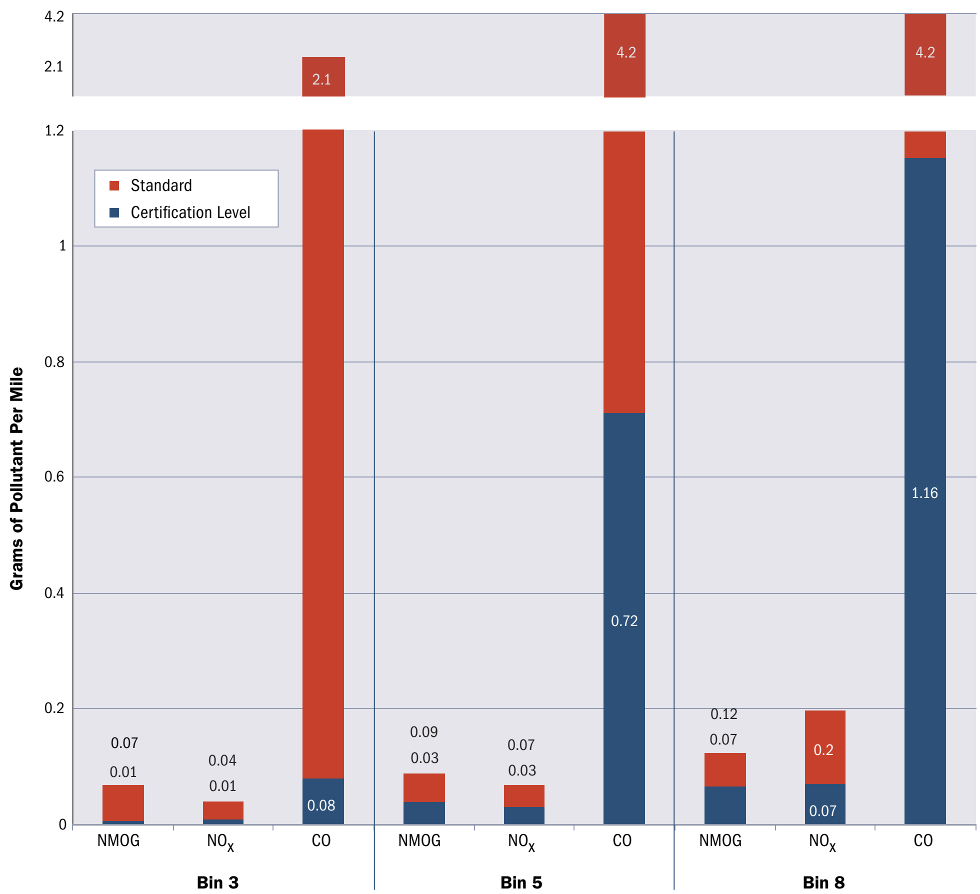


Figure 37. Tier 2 Bin Certification Levels and Compliance Margins

Note: Manufacturer-specific data are presented in Appendix A.

Figures 38, 39, and 40 below present the MY 2007 average certification levels along with the standards for Tier 2 Bin 5 for each major manufacturer. Some closely related manufacturers share a graph. In these graphs, two values are present for each bar; the top value is the standard, and the bottom value is the certification level.

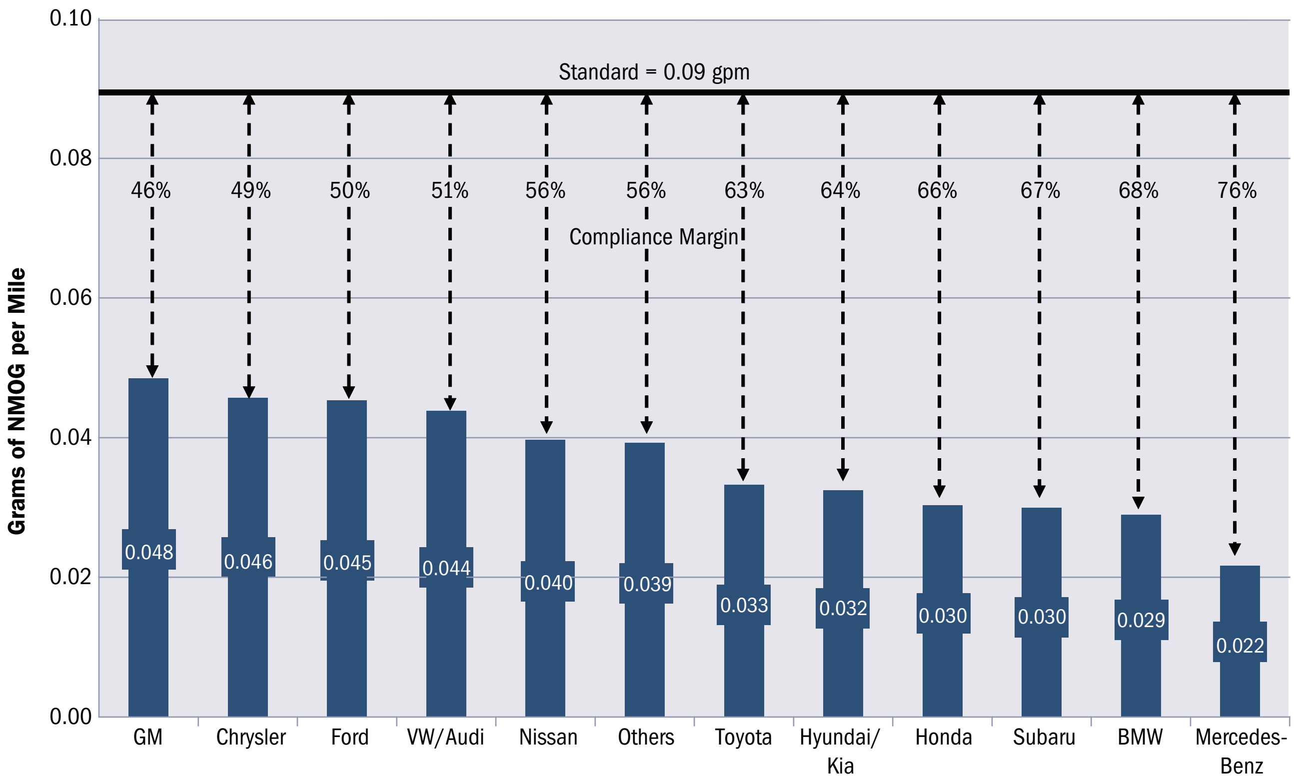


Figure 38. Tier 2 Bin 5 Certification Levels and Compliance Margins for NMOG

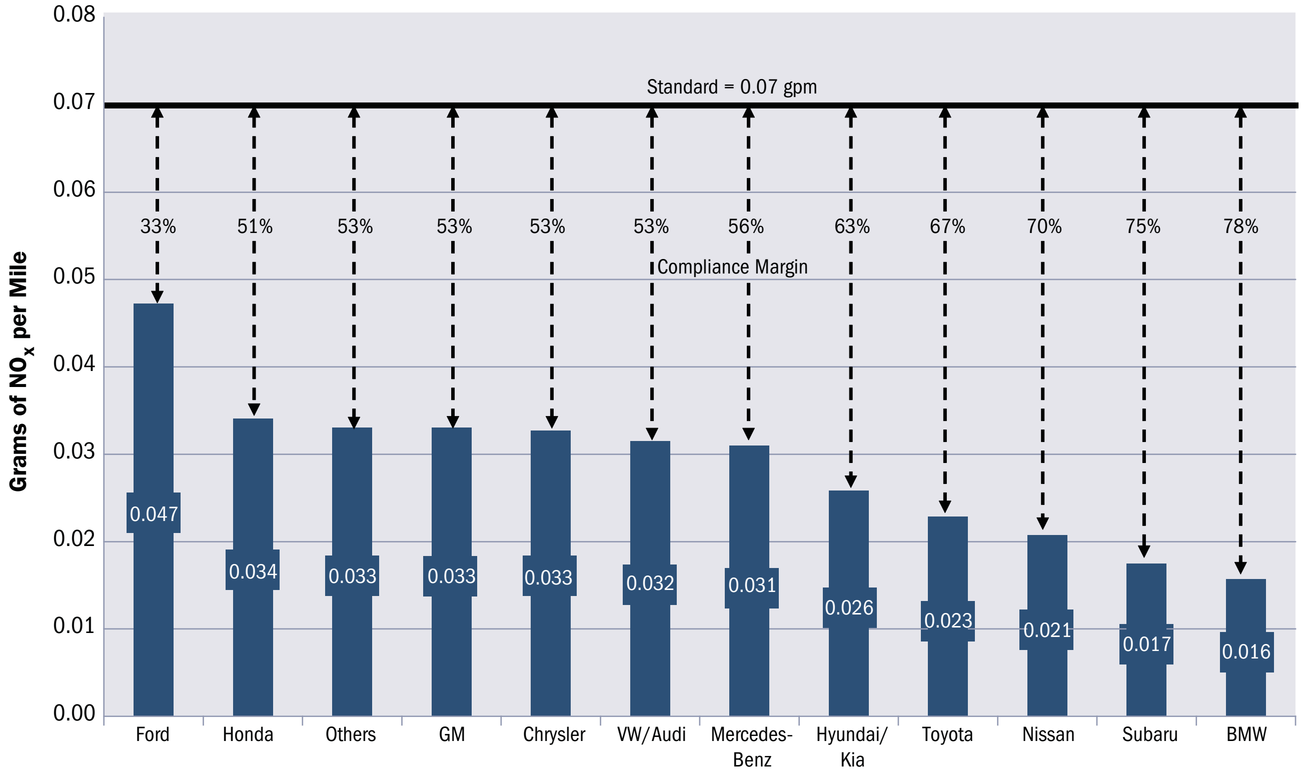


Figure 39. Tier 2 Bin 5 Certification Levels and Compliance Margins for NO_x

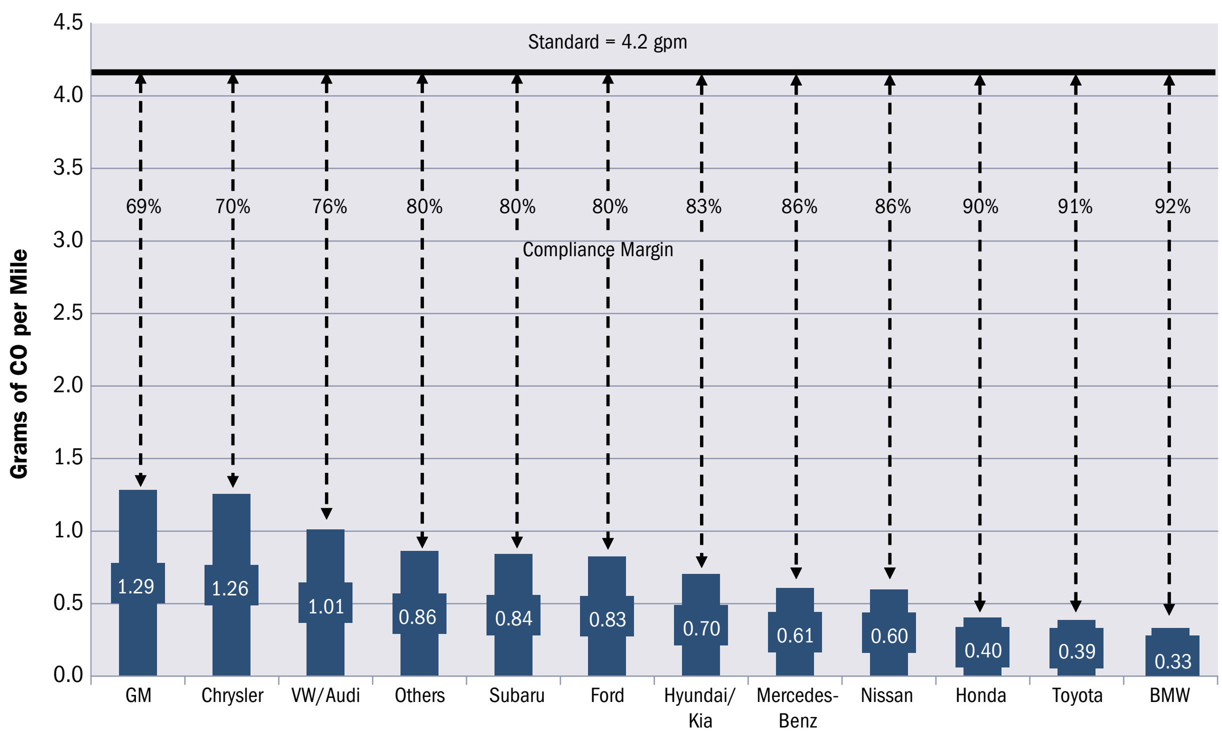


Figure 40. Tier 2 Bin 5 Certification Levels and Compliance Margins for CO

B. Heavy-Duty Highway Engines

EPA's 2007 heavy-duty highway regulation provides an example of the types of regulatory flexibilities available to manufacturers of heavy-duty highway engines. The PM emission standard (0.01 g/brake horsepower/hour [bhp-hr]) took full effect with the 2007 model year. The NO_X and non-methane hydrocarbon (NMHC) standards (0.20 and 0.14 g/bhp-hr, respectively) are being phased in between MY 2007 and MY 2010. The phase-in requirement is on a percent-of-sales basis: 50 percent from MY 2007 to MY 2009 and 100 percent in 2010. Additionally, manufacturers may be allowed to use emission credits to demonstrate compliance with the NO_X standard through an ABT program.

Fifty MY 2007 engine families were certified through the use of phase-in or credits provisions (Figure 41). Note the Family Emission Limit means an emission level that is declared by the manufacturer to serve in lieu of the emission standard for certification purposes and for the ABT Program.

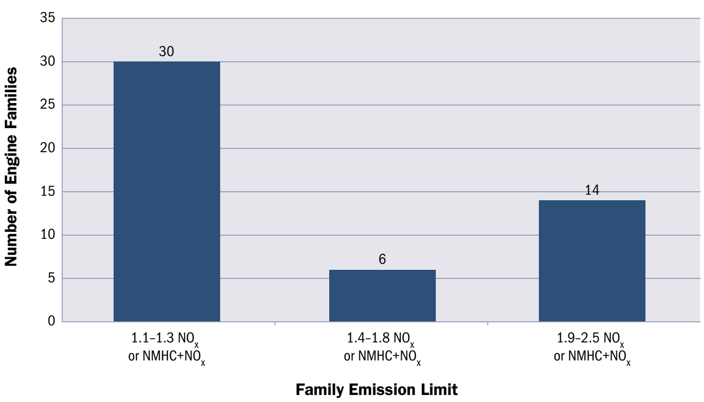


Figure 41. On-Highway Engine Family Certification by Family Emission Limit, MY 2007

Cummins certified a MY 2007 light-duty truck with a NO_X adsorber at 0.2 g/mile NO_X, which allowed the company to produce other engines at the 2004 NMHC+NO_X standard (2.5 g/bhp-hr) through use of the phase-in provisions in the regulations.

With respect to PM, most MY 2007 engine families were certified at 0.01 g/bhp-hr. However, three engine families were certified at the 2004 PM standard (0.10 g/bhp-hr) through use of another flexibility provision. Manufacturers who certified engines early in 2006 utilizing diesel particulate filters (DPFs) were allowed to certify engines in 2007 without DPFs on a 1:1.5 production volume basis. This means that for every two engines sold with a DPF prior to MY 2007, a manufacturer may sell three engines without a DPF in model years 2007 through 2009. The intent of this flexibility is to encourage early introduction of new emission control technology to the marketplace.

C. Nonroad Engines and Equipment

EPA's nonroad engine emission regulations provide many program designs and options to provide engine and equipment manufacturers with compliance flexibility. Two of the most prominent programs are the ABT program and the Transition Program for Equipment Manufacturers (TPEM).

1. ABT for Nonroad Engines

ABT provisions in many EPA regulations allow manufacturers to certify engine families in their product line at levels above the emission standard, provided that these emission "deficits" are offset by positive credits from engine families they certify below the standard. The flexibility to meet overall emission standards by ABT credits facilitates earlier introduction of clean technology into the market than would otherwise be feasible. ABT has proven to be a successful tool in multiple sectors including nonroad diesel, marine diesel, heavy-duty highway diesel and gasoline, small and marine SI, snowmobile, and locomotive engines.

Participation in the voluntary ABT program ranges in both the number of participants (two manufacturers for the marine diesel sector to 26 manufacturers for small SI engines) and the pollutants for which credits are generated or used. The tables that follow provide information on which companies participate in generating or consuming credits, by sector. The level of activity in any given sector, as characterized by the number of trades and the size of the overall credit bank for the sector, can provide useful information about the technologies and compliance strategies being used in the sector. For 2007, EPA is presenting early information about companies taking advantage of the ABT provisions. Specifically, Tables 17 through 24 show the manufacturers participating in ABT by industry. If a "yes" is listed for a manufacturer under a pollutant, it means the manufacturer is either generating or using credits for that pollutant in the 2007 model year. EPA anticipates including a more comprehensive analysis and quantitative assessment of these programs in future reports.

Table 17. Marine Diesel Engine Manufacturers Participating in ABT in the 2007 Model Year

Manufacturer	PM Credits	THC+NO_X Credits
Detroit Diesel	No	Yes
Isuzu Motors	Yes	Yes

Table 18. On-Highway Diesel Engine Manufacturers Participating in ABT in the 2007 Model Year

Manufacturer	$NMHC+NO_x$ Credits	NO_x Credits	PM Credits
Caterpillar	Yes	Yes	No
Cummins	Yes	Yes	No
Detroit Diesel	Yes	Yes	No
General Motors	Yes	Yes	Yes
Hino Motors	Yes	Yes	No
International Truck and Engine	Yes	Yes	No
Isuzu Motors	Yes	Yes	No
John Deere	Yes	Yes	No
Volvo Powertrain	Yes	Yes	No

Table 19. Nonroad Diesel Engine Manufacturers Participating in ABT in the 2007 Model Year

Manufacturer	$NMHC+NO_x$ Credits	PM Credits
CNH Engine Corporation	Yes	No
Cummins	Yes	Yes
John Deere	Yes	Yes
Komatsu	Yes	Yes
Perkins Engines	Yes	Yes
VM Motori	Yes	No
Yanmar	No	Yes

Table 20. On-Highway Otto Cycle Engine Manufacturers Participating in ABT in the 2007 Model Year

Manufacturer	$NMHC+NO_x$ Credits
Bi-Phase Technologies	Yes
Clean Fuel USA	Yes
Ford	Yes
General Motors	Yes

Table 21. Small SI Nonroad Engine Manufacturers Participating in ABT in the 2007 Model Year		
Manufacturer	**CO Credits**	**$NMHC+NO_x$ Credits**
Andreas Stihl	Yes	Yes
Atlas Copco Construction Tools	Yes	Yes
Briggs & Stratton	Yes	Yes
Chongqing Lifan Industry Group	No	Yes
Echo/Kioritz	Yes	Yes
EMAK	Yes	Yes
Fuji Heavy Industries	No	Yes
GXi International	Yes	Yes
Homelite Consumer Products	Yes	Yes
Honda	No	Yes
Husqvarna	No	Yes
Husqvarna Outdoor Products	Yes	Yes
Kawasaki Heavy Industries	No	Yes
Kohler Power Systems	Yes	Yes
Komatsu Zenoah	Yes	Yes
Liquid Combustion Technology	No	Yes
Makita Numazu	No	Yes
Makita USA/Dolmar	Yes	Yes
Mitsubishi Heavy Industries	No	Yes
MTD Southwest	No	Yes
Onan	Yes	Yes
Shindaiwa	Yes	Yes
Tanaka Kogyo	No	Yes
Tecumseh Power	Yes	Yes
Wenling Jennfeng Industry	Yes	Yes
Yamaha Motor Company	Yes	Yes

Table 22. Marine SI Engine Manufacturers Participating in ABT in the 2007 Model Year	
Manufacturer	**THC+NO_x Credits**
Bombardier Recreational Products	Yes
Briggs & Stratton	Yes
Honda	Yes
Kawasaki Heavy Industries	Yes
Mercury Marine	Yes
Surfango	Yes
Suzhou Parsun Power Machine	Yes
Suzuki	Yes
Sword Marine Technology	Yes
Tohatsu	Yes
Weber Motor	Yes
Yamaha Motor Company	Yes

Table 23. Snowmobile Manufacturers Participating in ABT in the 2007 Model Year		
Manufacturer	**CO Credits**	**HC Credits**
Arctic Cat	Yes	Yes
Bombardier Recreational Products	Yes	Yes
Polaris Industries	Yes	Yes
Yamaha Motor Company	Yes	Yes

Table 24. Locomotive Manufacturers Participating in ABT in the 2007 Model Year

Manufacturer	NO_x Credits	PM Credits
Advanced Global Environmental	No	No
CSXT Environmental	No	No
EcoTrans Environmental	No	No
Electro-Motive Diesel	Yes	Yes
MotivePower	Yes	Yes
National Railway Equipment	No	No
Railpower Hybrid Technologies	Yes	Yes
Transportation Systems Business Operations of General Electric	Yes	No

2. Transition Program for Equipment Manufacturers (TPEM)

EPA created TPEM in an effort to provide original equipment manufacturers (OEMs) with flexibility to comply with new emission regulations. When EPA lowers emission standards, engine manufacturers might need to redesign their engines to achieve the required emission reductions. Consequently, OEMs might also need to redesign their products to accommodate these engine design changes. TPEM allows OEMs to continue using engines that comply with the previous set of emission standards ("noncompliant engines") for up to seven years after the new regulations first apply. Participation is voluntary. Participating OEMs may choose between two options per power category:

- Small-volume allowance—OEMs may install noncompliant engines in up to 200 pieces of equipment per year, not to exceed 700 pieces in the seven-year period (other limitations apply)
- Percent of production allowance—OEMs may use noncompliant engines in percentages over the period of participation not exceeding 80 percent.

Engine manufacturers are required to report numbers of noncompliant engine sales to EPA. In these reports, the equipment manufacturer to which the engines were sold is included in the summary for each engine family.

TPEM is available only during a specific period of time for each power category. Table 25 indicates when the program is available. In some cases, the period of participation has already expired. Manufacturers must report their TPEM activities within a year of ending their participation.

Table 25. TPEM Allowance per Power Category		
Power Category	**First Year of Allowance**	**Last Year of Allowance**
kW < 8 (hp < 11)	2000	2006
8 ≤ kW < 19 (11 ≤ hp < 25)	2000	2006
19 ≤ kW < 37 (25 ≤ hp < 50)	1999	2005
37 ≤ kW < 75 (50 ≤ hp < 100)	2004	2010
75 ≤ kW < 130 (100 ≤ hp < 175)	2003	2009
130 ≤ kW < 225 (175 ≤ hp < 300)	2003	2009
225 ≤ kW < 450 (300 ≤ hp < 600)	2001	2007
450 ≤ kW ≤ 560 (600 ≤ hp ≤ 750)	2002	2008
< 560 (> 750 hp)	2006	2013

In 2007, eight OEMs voluntarily notified EPA of their intent to begin participating in TPEM under the categories for which the program is still available. The Agency received 16 reports from engine and equipment manufacturers in 2007 and is currently evaluating them. OTAQ works with OECA to ensure compliance with TPEM requirements.

A new TPEM begins in 2008 for manufacturers using Tier 4 engines. This new program has more stringent participation and reporting requirements. It requires OEMs to notify us before they use this flexibility. In 2007, eight OEMs notified us of their intent to participate in 2008. OEMs must also submit annual reports documenting their compliance with the terms of the program.

Currently, TPEM is only available for diesel construction and agricultural equipment. However, the Agency intends to extend this flexibility to other nonroad engine categories in the future.

VI. Summary: 2007 Compliance Highlights

A. Light-Duty Highlights

In 2007, EPA continued its implementation of the stringent Tier 2 emission standards. For light-duty vehicles and smaller light-duty trucks, the Tier 2 NO_x fleet average standard of 0.07 g/mi was fully implemented. For larger light-duty trucks and medium-duty passenger vehicles, this was the last year that these vehicles could comply exclusively with the Interim Non-Tier 2 NO_x fleet average standard of 0.20 g/mi. Light-duty vehicles are now being certified at very clean levels, with most vehicles meeting the Tier 2 Bin 5 emissions requirements, with a significant compliance margin as well.

EPA also began implementing the new "5-cycle" fuel economy labeling requirements, which require manufacturers to measure fuel economy over five test cycles: city, highway, US06, SC03, and cold CO, compared to just the city and highway test cycles used in the past. These additional test cycles cover a broad range of vehicle operation, such as high speeds, aggressive accelerations, air-conditioning, and cold temperature. These conditions were not captured over the original two test cycles. The new 5-cycle requirements result in fuel economy label estimates that better reflect actual vehicle operation. City fuel economy estimates are reduced on average by 12 percent from the previous estimates, with some vehicles, such as hybrids, experiencing a reduction of up to 30 percent. Highway fuel economy estimates are reduced on average by 8 percent from previous estimates with some vehicles experiencing a reduction of up to 25 percent. EPA also began using a redesigned fuel economy label for all light-duty vehicles and trucks. The new label incorporates improved graphics and information that make the labels more consumer-friendly and useful.

EPA implemented new durability procedures for cars and light trucks. These procedures introduced new durability test cycles for aging vehicles and components. Each manufacturer must supply information to EPA on in-use performance. If the results are acceptable, EPA approves the manufacturer's durability process for that model year. Each manufacturer's durability process must be approved each year.

EPA also implemented evaporative permeation requirements for motorcycles and ATVs. These were the first EPA permeation requirements for nonroad vehicles. These requirements reduce the amount of hydrocarbon vapor that permeates through plastic fuel tanks and rubber fuel lines.

EPA had several certification firsts. Certificates were issued for the first Tier 2 Bin 8 diesel vehicle (Mercedes-Benz E320 Bluetec) and the first heavy-duty vehicle compliant with the new stringent 2010 heavy-duty 0.2 g/mi NO_x emission standards (Dodge Ram 2500/3500 with the 6.7 liter Cummins engine). The Dodge Ram was also the first chassis-certified heavy-duty vehicle. EPA also published guidance describing certification procedures for light-duty vehicles and heavy-duty engines that use selective catalyst reduction technologies. Finally, EPA successfully tested the first four-wheel drive confirmatory test vehicle on the new EPA four-wheel drive dynamometer.

During 2007, light-duty vehicle manufacturers issued 48 emission-related recalls covering 3,024,236 vehicles. This was up from 42 recalls and 2.6 million vehicles in 2006.

BMW agreed to recall and fix 75,000 MY 2004 through MY 2006 X5 SUVs as a result of emission failures discovered in the program. IUVP testing showed high NO_x emissions. As a result, BMW agreed to recall the vehicles following the development of calibration changes to lower the emission levels.

After EPA intervention, Volkswagen agreed to provide extended catalytic converter warranties for 340,000 vehicles, including the MY 2001 through MY 2003 Golf, Jetta, and new Beetle models with 2.0 liter engines because of catalyst mat retention failures. The warranty was extended from the required eight years or 80,000 miles to 10 years or 100,000 miles.

OTAQ played a key role in a landmark enforcement settlement involving the illegal sale of an aftermarket tampering device that interferes with a vehicle's OBD catalyst monitoring system. EPA discovered the devices, which are called oxygen sensor simulators. When installed, they trick the OBD catalyst monitor into sensing a properly functioning catalyst even when the catalyst is missing or faulty. EPA considers oxygen sensor simulators to be illegal defeat devices under the CAA. OECA and the Department of Justice investigated, tested, and evaluated these devices, which were marketed by Casper's Electronics. In a settlement announced on July 10, 2007, Casper's was required to pay civil penalties, recall the devices, and stop selling them. Publicity about the settlement helped stop other marketers of these devices from selling them as well.

B. Heavy-Duty and Nonroad Highlights

The stringent 2007 heavy-duty emission standards took effect this year. EPA's implementation of the standards included reviewing computer software associated with the new emission control technology. The goal of the review is to ensure that engines will be designed to meet emission standards over the broadest operating range achievable with current technology. EPA review of this software led to design changes, preventing an estimated 140,000 tons of excess NO_x from MY 2007 engines. This was accomplished without causing delays of engine production.

EPA conducted confirmatory testing of 11 nonroad diesel engines. This effort represents a broadening of EPA's compliance presence in the nonroad and heavy-duty sectors. In addition to a regular certification confirmatory testing program for nonroad diesel engines, small SI engines (below 25 hp) will also be tested in the coming year. Confirmatory testing in the power range of 250 to 450 hp was undertaken in 2007; however, this will be expanded in the future to include additional nonroad diesel engines beyond that range. The small SI testing capability will allow for testing of new engines as well as pave the way for future in-use compliance efforts.

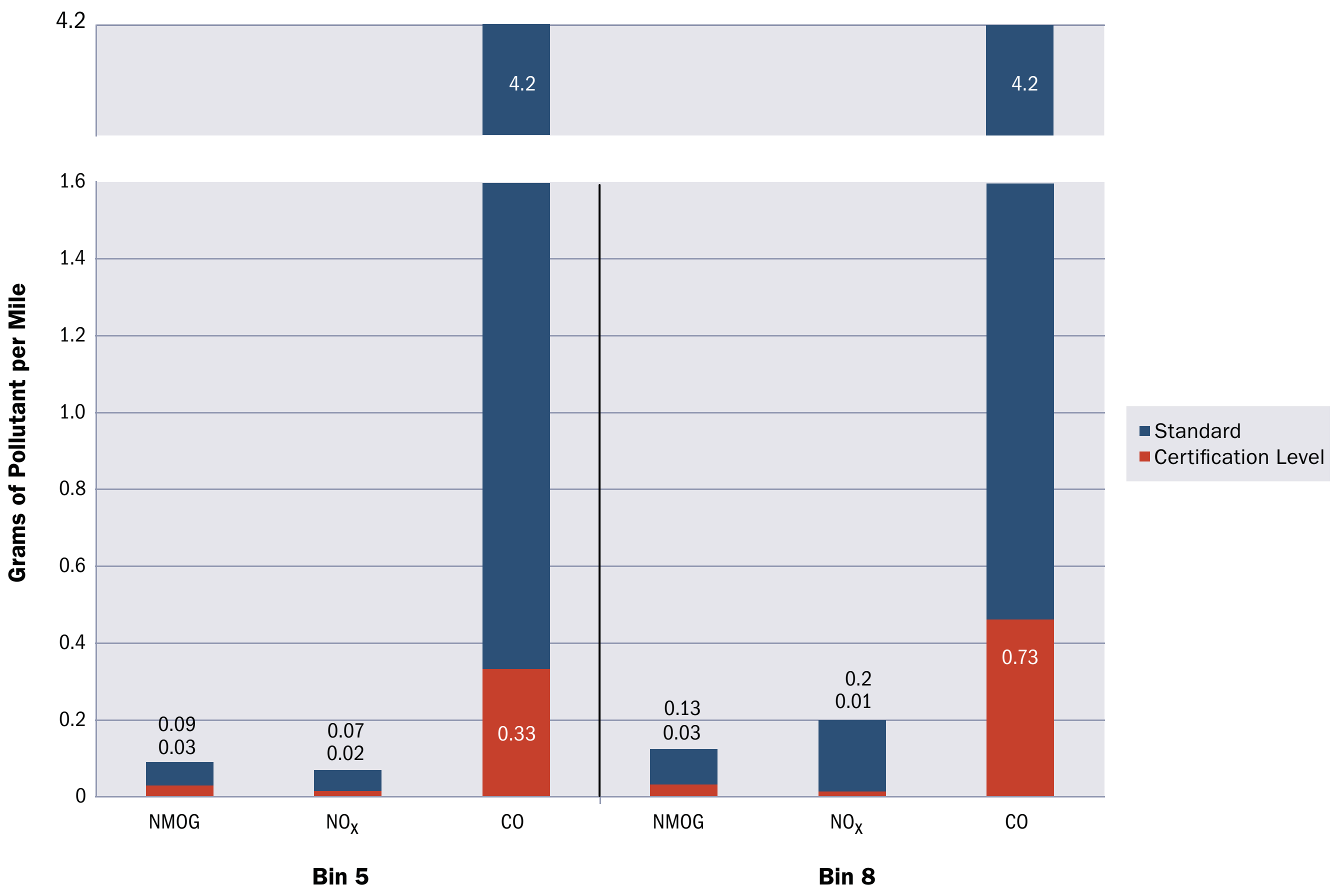
EPA conducts more than 200 in-use tests annually for heavy-duty highway and nonroad diesel engines. EPA's in-use and production line test programs have yielded test data on production engines in the real world that encourage manufacturers to make every effort to ensure that real-world production matches design targets in the certification applications. Recently, in-use measurement allowances for gaseous pollutants have been developed. These allowances facilitate the successful implementation of the new manufacturer-run in-use test program for gaseous pollutants.

EPA also worked with more than 30 companies and U.S. Customs and Border Protection (CBP) to ensure that used Japanese mini-trucks were properly imported into the United States. The mini-trucks were used as highway vehicles in other countries, but they do not meet EPA emission standards for light-duty trucks and can only be legally imported as unregulated nonroad vehicles, if properly modified for speed restriction. Numerous CBP ports stopped illegal importations of unmodified mini-trucks and referred the cases to EPA. EPA worked to ensure future legal importation of mini-trucks by educating prospective importers on the proper methods for limiting the mini-trucks' maximum speed to 25 miles per hour.

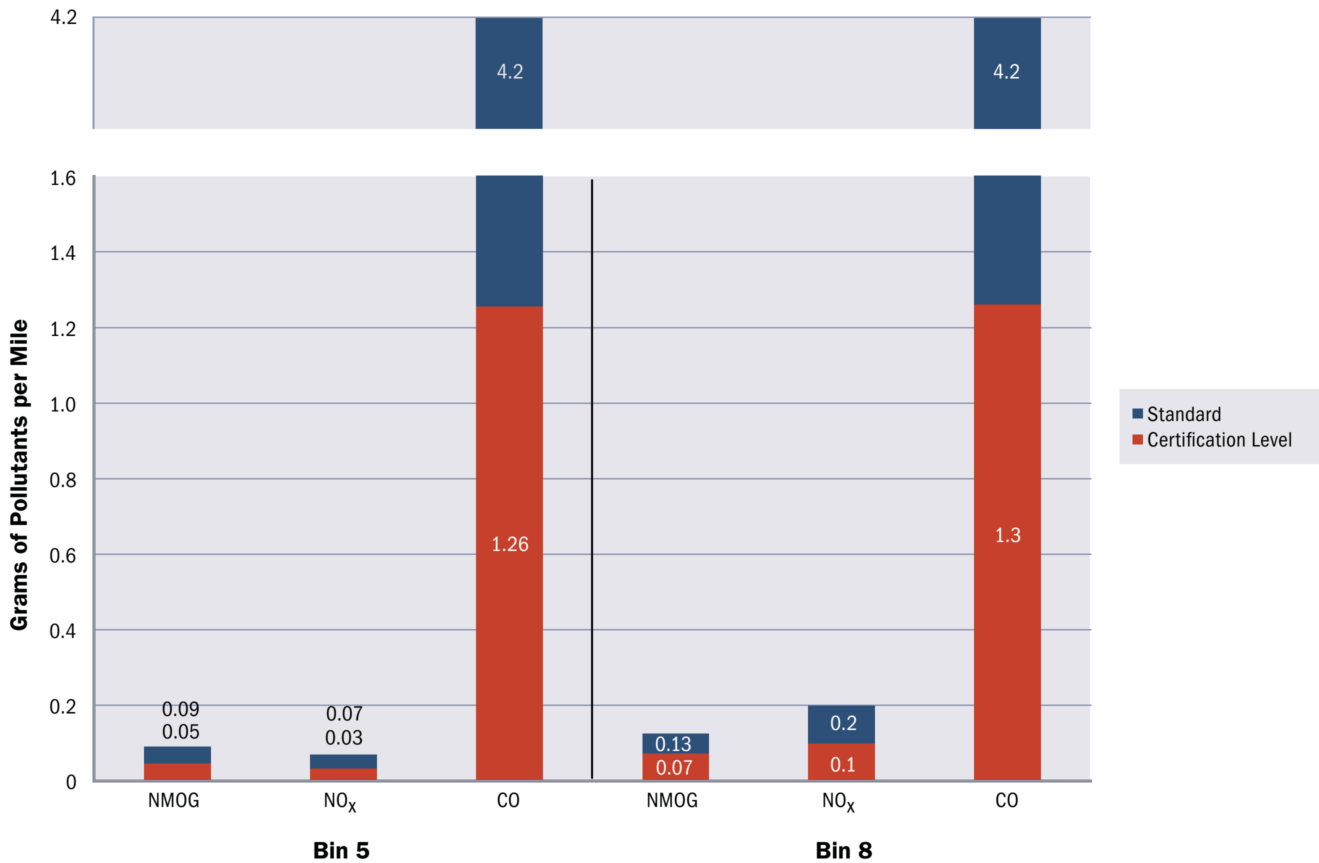
Appendix A.
Tier 2 Manufacturers' Average Certification Level vs. the Standard

The following graphs present the MY 2007 average certification levels with the appropriate standards for Tier 2 Bins 3, 5, and 8 for each major manufacturer. Related manufacturers (e.g., VW/Audi) are presented in one graph. Two values are represented in each bar; the top value is the standard, and the bottom value is the certification level.

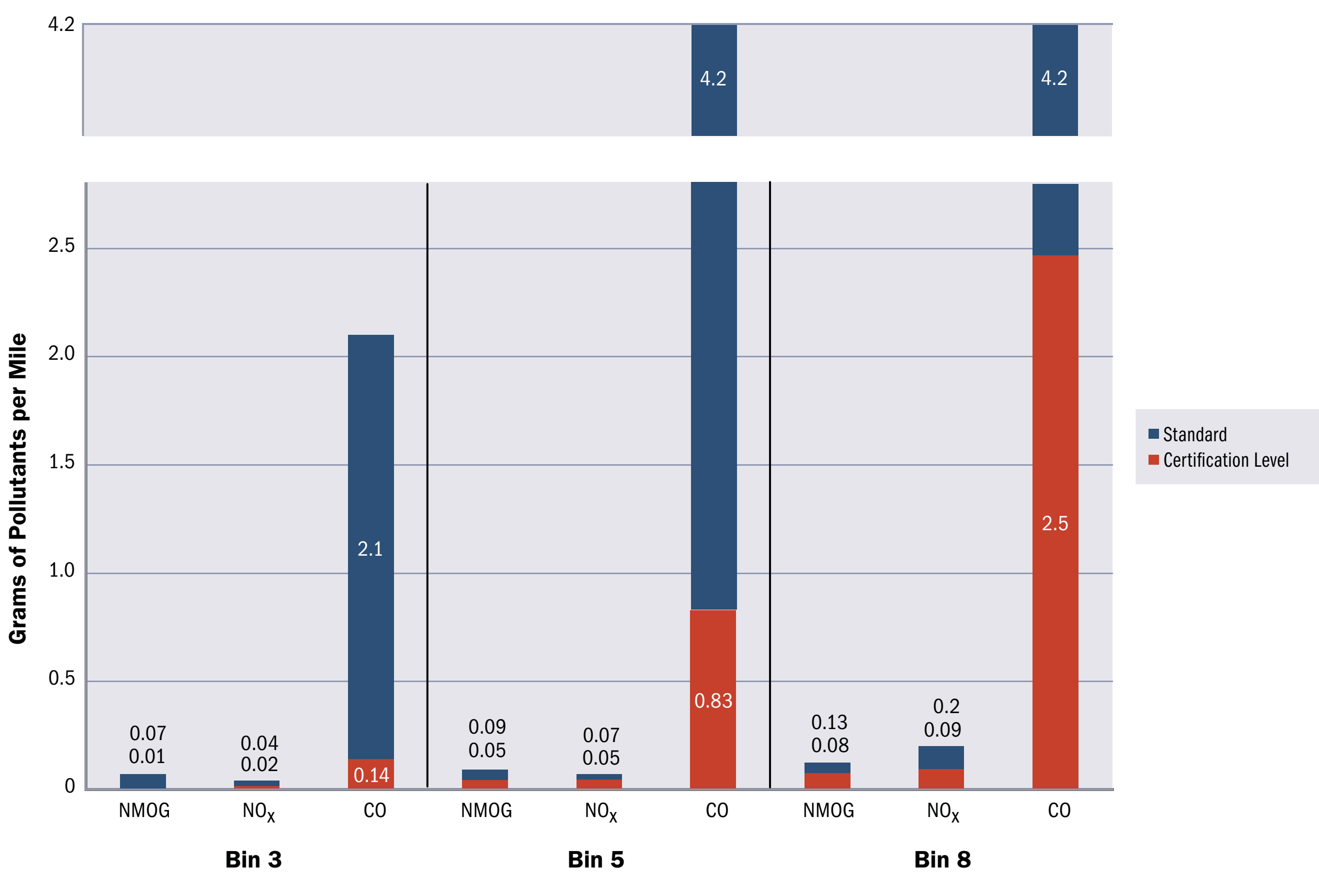
Note that the CO standards fall out of the range of the chart because the standard levels for NO_x and NMOG are much lower. Also, not all graphs have Bin 3 or 8 data because not all manufacturers had vehicles certified to Bin 3 or 8 for MY 2007.



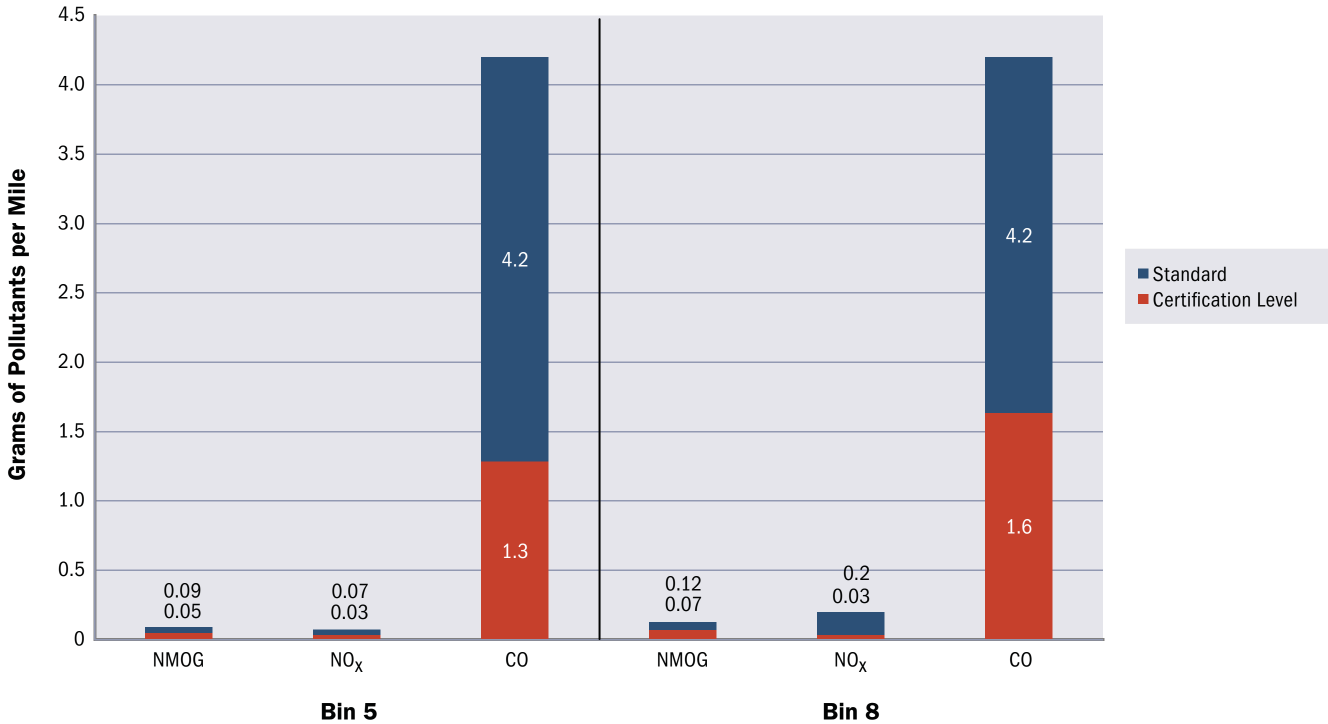
BMW Tier 2 Average Certification Level vs. the Standard



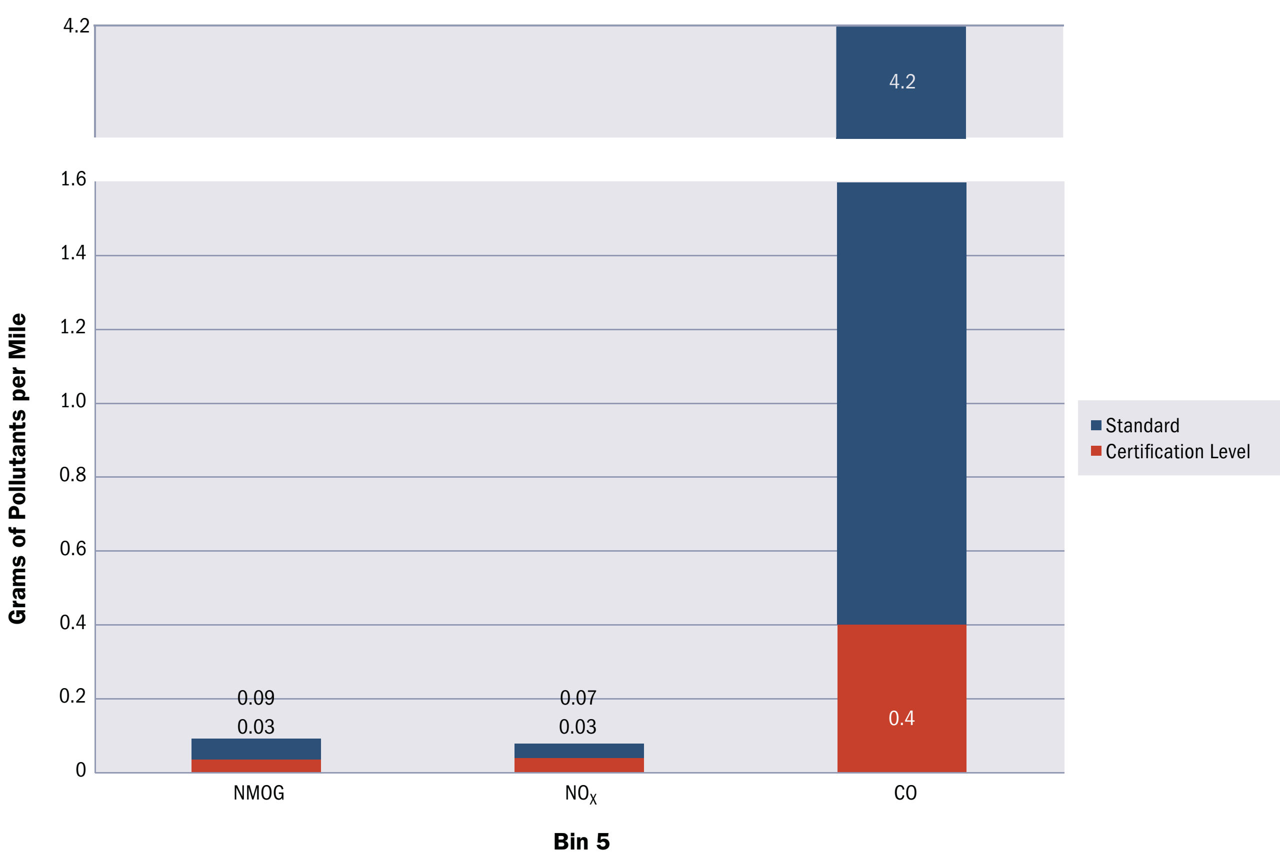
Chrysler Tier 2 Average Certification Level vs. the Standard



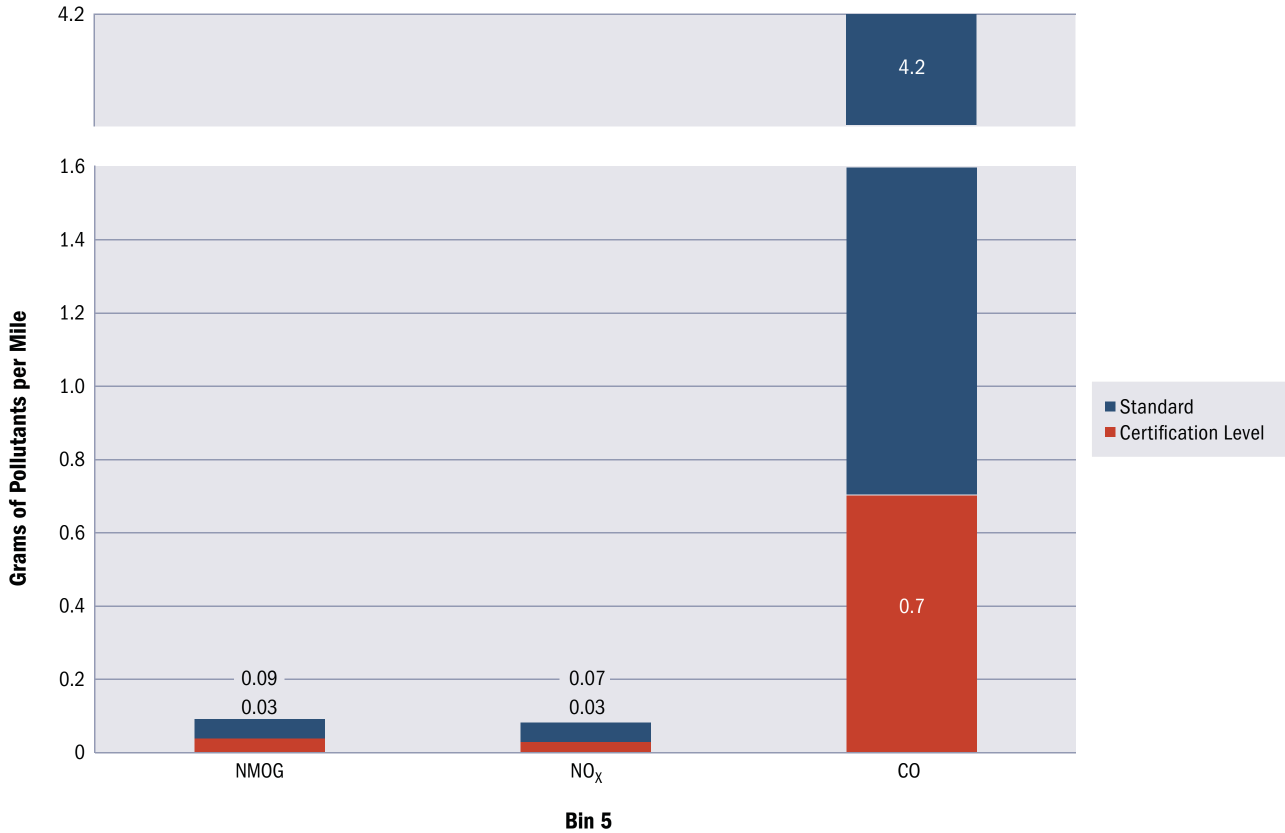
Ford Tier 2 Average Certification Level vs. the Standard



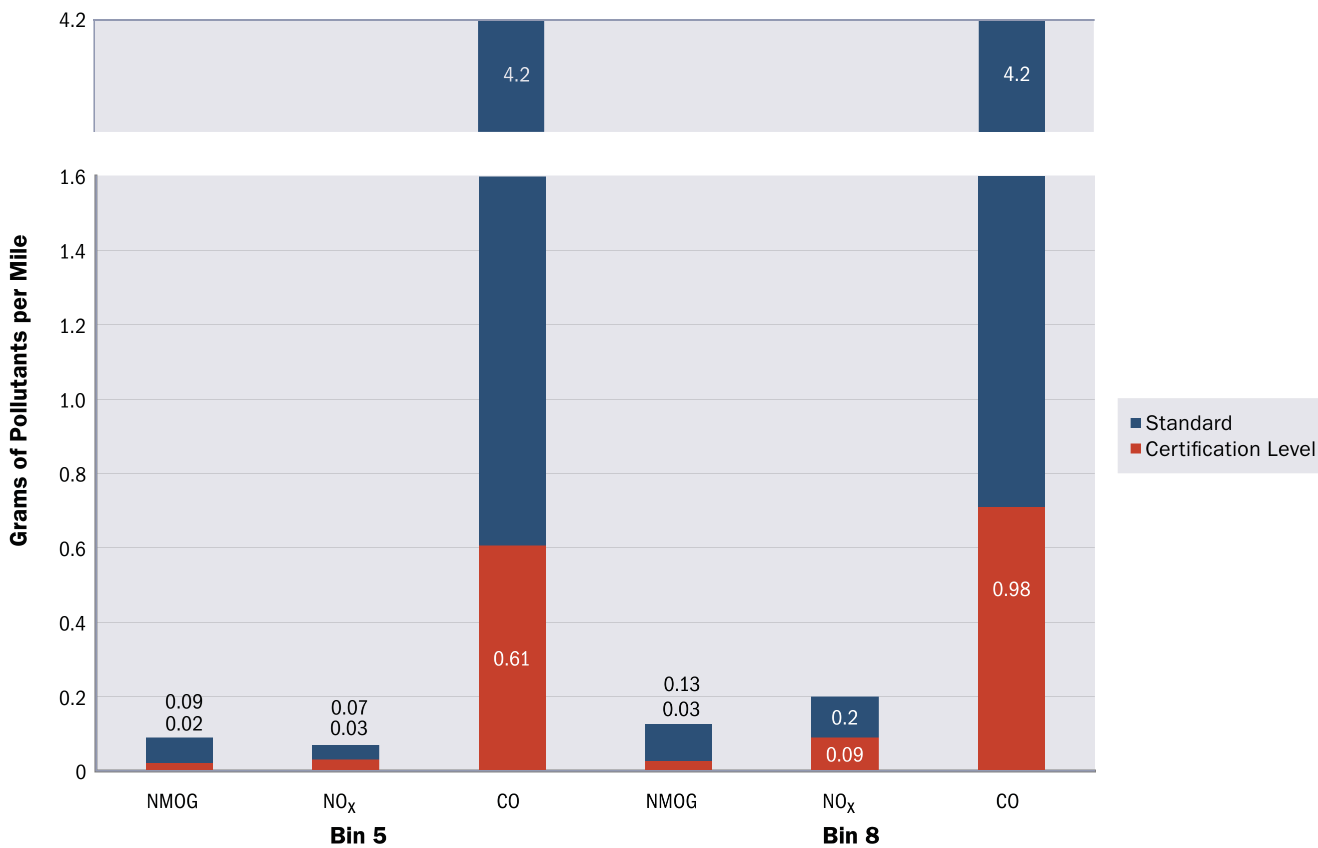
General Motors Tier 2 Average Certification Level vs. the Standard



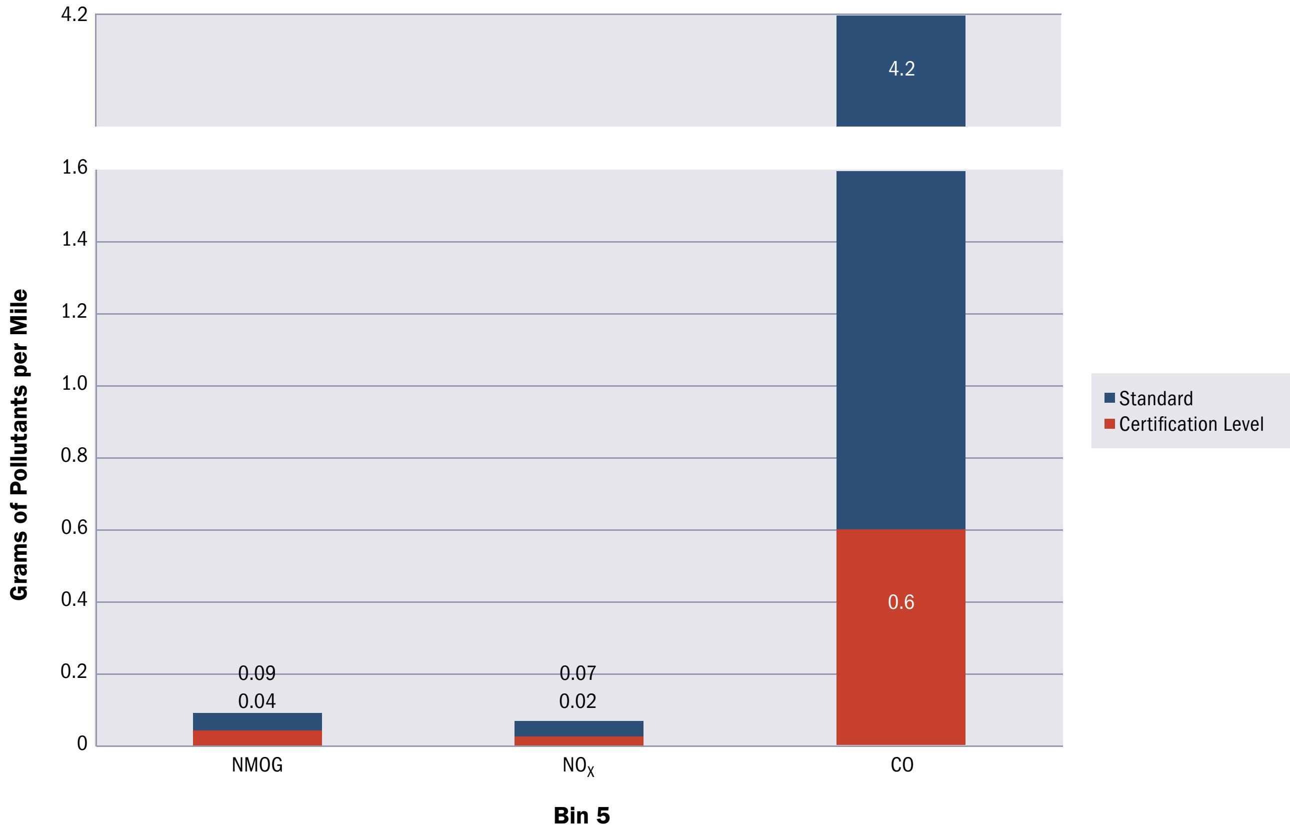
Honda Tier 2 Average Certification Level vs. the Standard



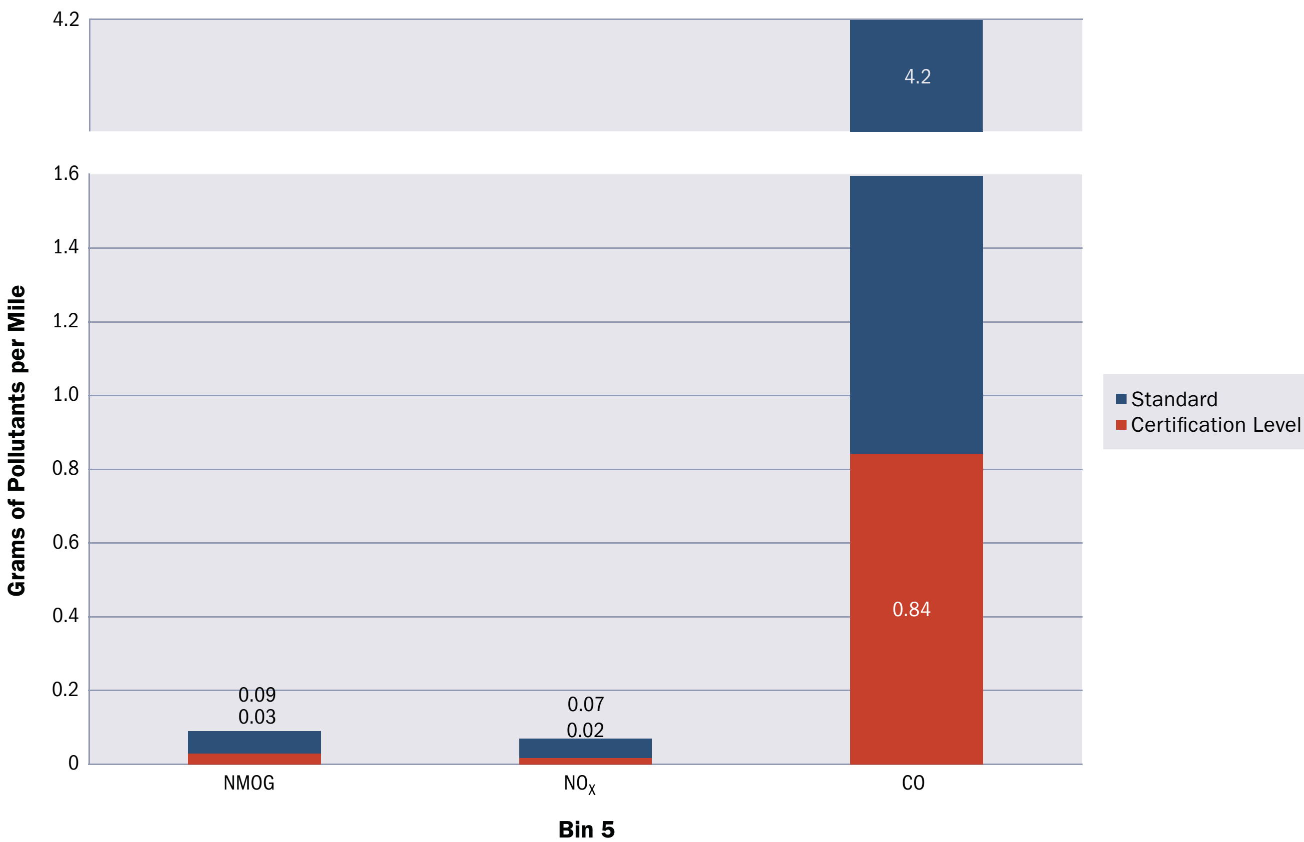
Hyundai/Kia Tier 2 Average Certification Level vs. the Standard



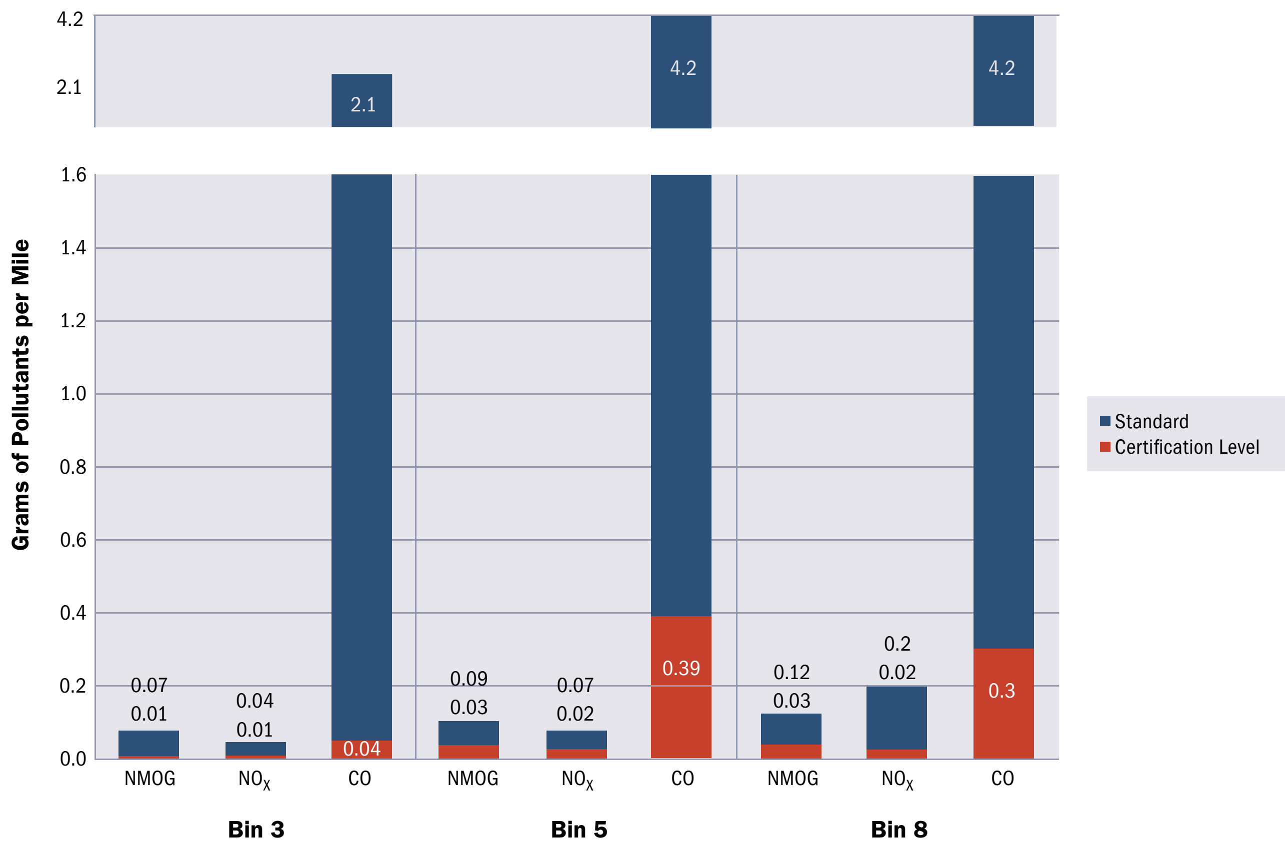
Mercedes-Benz Tier 2 Average Certification Level vs. the Standard



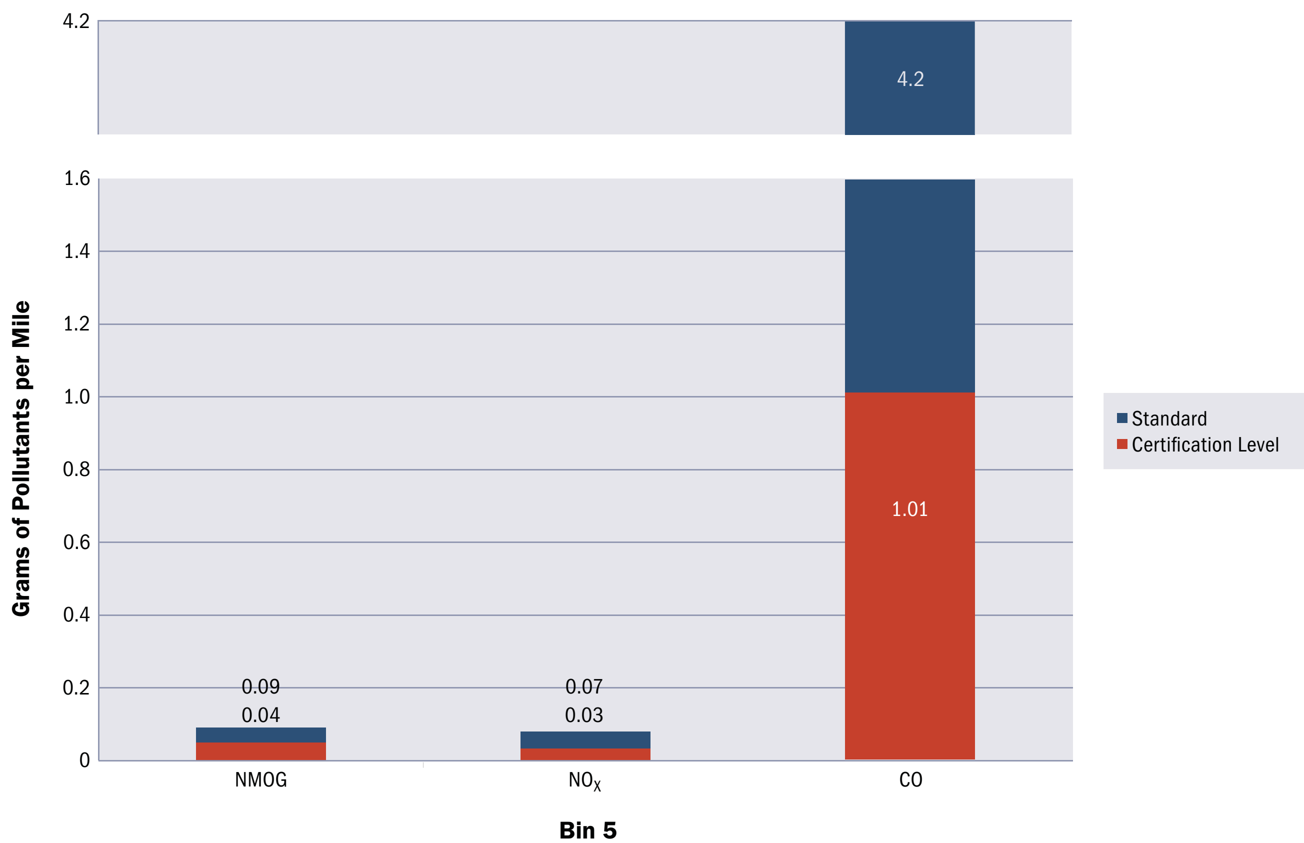
Nissan Tier 2 Average Certification Level vs. the Standard



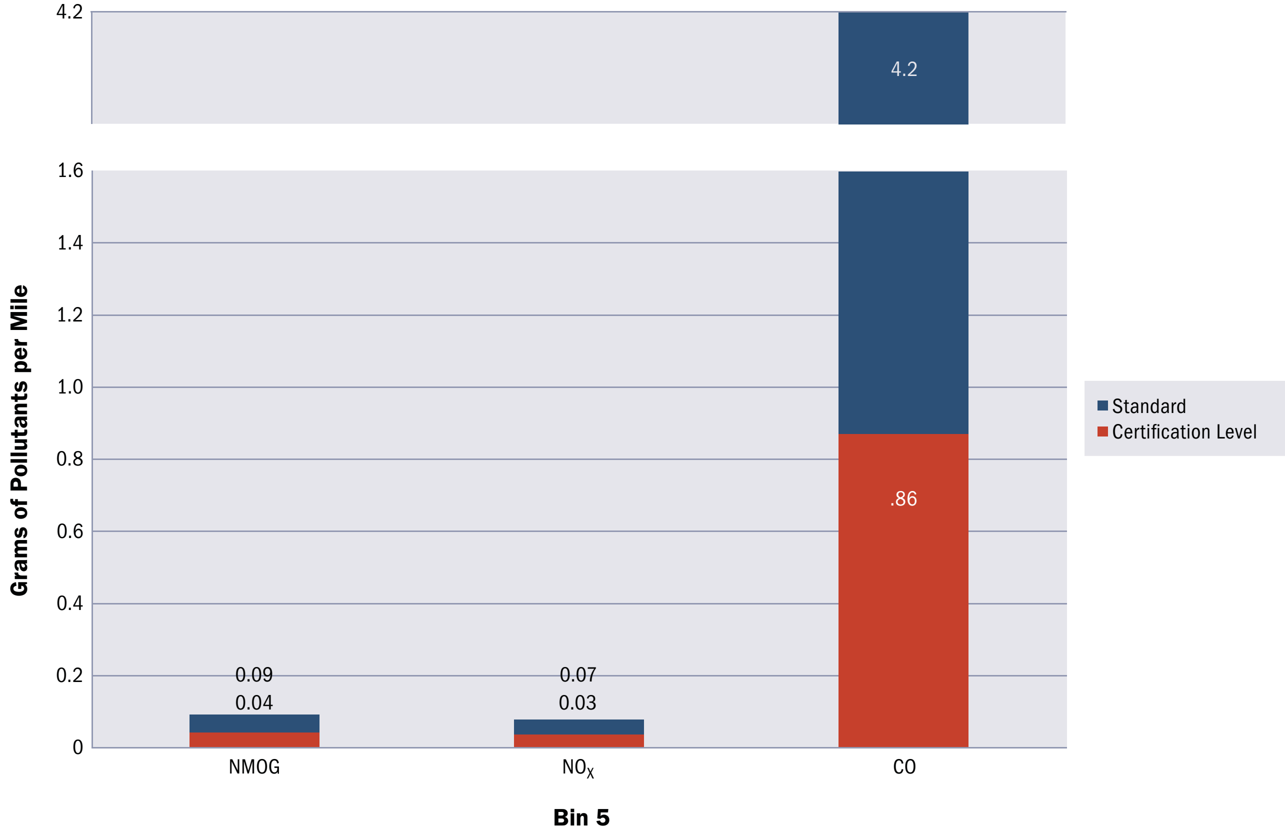
Subaru Tier 2 Average Certification Level vs. the Standard



Toyota Tier 2 Average Certification Level vs. the Standard



VW Tier 2 Average Certification Level vs. the Standard



Other Manufacturers Tier 2 Average Certification Level vs. the Standard

Appendix B. Compliance Data Sources

EPA relies on a significant amount of data to support its certification and compliance decisions for all regulated sectors. EPA uses several information databases to gather information from regulated parties. They include:

Verify—EPA's Verify Vehicle and Engine Compliance Computer System collects emissions and fuel economy compliance information for all types of vehicles (mobile sources of air pollution), including light-duty vehicles and heavy-duty engines, locomotives, and motorcycles and ATVs. Vehicle and engine manufacturers report this information to the Verify system. The database gathers and processes the data, confirms fee payment, issues certificates of conformity, and supports other compliance functions.

DCFuels—The DCFuels database collects and tracks the quality and quantity of fuel and fuel additives used in the United States. The system collects more than 100,000 electronic and paper reports per year from refiners, importers, laboratories, pipelines, terminals, additive manufactures, and rail and barge companies. In 2007, DCFuels introduced a highly secure online submittal process, through EPA's Central Data Exchange, that digitally signs and encrypts each submission.

Engine Information Management System—Nonroad engine certification information is collected and stored in the Engine Information System database. Engine manufacturers submit certification data in templates, which are reviewed and loaded directly into the database. Certified engines in agricultural and construction equipment; forklifts, generators, and compressors; lawn and garden equipment; diesel boats, ships, and oceangoing vessels; gasoline boats and personal watercraft; and snowmobiles are included in this system.

Appendix C. Useful References and Web Links

OTAQ Progress Report. This report presents the most recent developments in OTAQ's key program areas. It can be found at www.epa.gov/otaq/about/420r05011.pdf.

Fuel Economy Trends Report. This report provides data on the fuel economy and technology characteristics of new light-duty vehicles for MY 1975 through MY 2006. It can be found at www.epa.gov/OTAQ/fetrends.htm.

Fuel Trends Report. This report provides a comprehensive look at fuel trends over the last several years. It can be found at www.epa.gov/otaq/fueltrendsreport.htm.

Emission Standards Brochure. This brochure summarizes emissions standards, including those developed by EPA, the California Air Resources Board, the European Union, and others. It can be found at www.epa.gov/otaq/standardsbrochure.htm.

Verify Web Site. The public Web site for Verify provides a variety of general information on the Verify system. It can be found at www.epa.gov/otaq/verify/index.htm.

Fuels Registration Web Site. This site contains reporting forms and associated instructions for the registration of fuels and fuel additives. These forms must be completed and submitted by producers and importers of gasoline, diesel fuel (including biodiesel), and fuel additives prior to their manufacture or import. The registration Web site can be found at www.epa.gov/OTAQ/regs/fuels/ffarsfrms.htm.

Document Index System (DIS). This system is a document database that provides Web-based access to EPA documents. With more than 4,000 certification and compliance documents in the DIS, the public can choose from a variety of search options to obtain such documents as manufacturers' certificates of conformity and applications, guidance letters, advisory circulars, and regulatory information. The DIS can be found at www.epa.gov/dis.

Green Vehicle Guide (GVG). This guide is an interactive Web site that rates cars and trucks based on emissions and fuel economy. It provides an online resource to help consumers choose the cleanest, most fuel-efficient vehicles to meet their needs. It is located at www.epa.gov/greenvehicles.

Engine Information System. This Web site provides certification information for nonroad engine categories, including agricultural and construction equipment; forklifts, generators, and compressors; lawn and garden equipment; diesel boats, ships, and oceangoing vessels; gasoline boats and personal watercraft; and snowmobiles. Most of this information is available at www.epa.gov/otaq/certdata.htm.

Light-Duty Certification Test Data. This site provides access to the emission test data used by EPA to certify light-duty vehicles. The data are available by model year, back to 1979. It has the grams-per-mile emission levels as well as the emission standard that applies to the test vehicle. It can be found at www.epa.gov/otaq/crttst.htm.

Fuel Economy Test Data. This site provides the test data that are used to calculate the city and highway fuel economy estimates. The data are available by model year, back to 1984. It provides the fuel economy values for each vehicle tested. These values are used to determine the EPA estimates posted on window stickers, but are not necessarily identical to the estimates, which are based on "model type" fuel economy, a calculated value that represents the average of various configurations that may be offered within a model type. The fuel economy test data can be found at www.epa.gov/otaq/tcldata.htm.

Fuel Economy Guide Data. This site provides the EPA fuel economy estimates that are posted on all new cars and light trucks, and which are compiled into the annual Fuel Economy Guide publication. Fuel economy information for each vehicle model type is included in the data, back to 1978. It can be found at www.fueleconomy.gov/feg/download.shtml.

Key to Acronyms

ABT	averaging, banking, and trading
ATV	all-terrain vehicle
bhp-hr	brake horsepower/hour
CAA	Clean Air Act
CAFE	Corporate Average Fuel Economy
CBP	Customs and Border Protection
CNG	compressed natural gas (mostly methane)
CO	carbon monoxide
CO_2	carbon dioxide
DPF	diesel particulate filters
E85	85 percent ethanol and 15 percent gasoline
EPA	U.S. Environmental Protection Agency
FEL	family emission limit
FTP	federal test procedure
HC	hydrocarbon
hp	horsepower
IUCP	In-Use Confirmatory Test Program
IUVP	In-Use Verification Program
LPG	liquefied petroleum gas
MIL	malfunction indicator light
mpg	miles per gallon
MY	model year
NMHC	non-methane hydrocarbon
NMOG	non-methane organic gases
NO_x	nitrogen oxides
NTE	not to exceed
OBD	onboard diagnostics
OECA	Office of Enforcement and Compliance Assurance
OEM	original equipment manufacturer
ORVR	onboard re-fueling vapor recovery
OTAQ	Office of Transportation and Air Quality
PEMS	portable emissions monitoring system
PM	particulate matter
ppm	parts per million
SI	spark-ignition
SUV	sport utility vehicle
TPEM	transition program for equipment manufacturers
ULSD	ultra-low sulfur diesel
VOC	volatile organic compound

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