
# Why Some Fuel-Efficient Vehicles Are Not Sold Domestically

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# Introduction

In 2011, more than 78 million light motor vehicles[1] were produced around the world. The top five vehicle manufacturing countries (in order of production) were China, the United States, Japan, Germany, and South Korea, which together accounted for about 60% of global light vehicle production.

Although millions of vehicles are exported and imported annually, vehicle manufacturing is still primarily regional. Most cars sold in Europe are produced there, and most cars sold in North America are produced in the United States, Canada, or Mexico. In 2011, 13 million cars and light trucks were sold in the United States, including 2.8 million imported from outside North America.

Consumer preferences and vehicle regulations and standards differ from country to country and reinforce regional vehicle manufacturing. This makes vehicles distinctly different from some other consumer products, such as electronics, which are produced only in a few countries and then sold globally. The absence of global standards for vehicle fuel efficiency and emissions means that a vehicle may not be sold in certain countries if the manufacturer is not willing to make major investments to bring the vehicle into compliance with local standards.

# Dieselization in Europe

The U.S. and European vehicle markets differ primarily in the use of diesel engines.[2] Nearly half the European car fleet is powered by diesel, whereas diesel vehicles account for less than 1% of sales in the United States.[3] In addition, about 80% of European vehicles have a manual transmission, while only about 7% of U.S. vehicles do.[4] European consumers have a preference for smaller engines as well and, in Europe, policies favor diesel over gasoline, resulting in lower diesel prices at the pump.[5] According to the European Automobile Manufacturers' Association,

> While the diesel engine may be more expensive to produce, the lower fuel consumption has been recognized for decades in commercial operations when one looks at purchasing and lifetime operating costs. With diesel [fuel] traditionally available in the EU at relatively low costs (due to relatively low demand for diesel in domestic use, such as heating) compared to gasoline and with the improvement of the diesel engine for passenger cars (in terms of less noise, better driving comfort and performance—enhanced by the turbo and direct injection—

[1] Unless otherwise noted, this report discusses light vehicles, a category that includes passenger cars and light trucks, including SUVs.

[2] Diesel has a low share of the light vehicle market in Japan and other Asian markets as well. Lisa Jerram and John Gartner, *Clean Diesel Vehicles—Light Duty and Medium Duty Clean Diesel Vehicles: Global Market Analysis and Forecasts*, Pike Research, Executive Summary, 2012, p. 2.

[3] Diesel vehicles were sold in the United States in the 1970s. and 1980s, but they emitted smoke and were deemed to be difficult to start and maintain by many consumers. Since then, significant changes have been made in diesel technology to improve engine performance and reduce emissions.

[4] In 1998, U.S. diesel vehicle sales accounted for about 0.1% of all vehicle sales, rising to 0.5% in 2009. United Nations Environmental Programme (UNEP) and the Global Fuel Economy Initiative (GFEI), *The European Union Automotive Fuel Economy Policy,* p. 2 and *The U.S. Automotive Fuel Economy Policy*, p. 1.

[5] In the United States, the August 13, 2012 national average price for gasoline was $3.72 per gallon, compared with $3.97 for a gallon of diesel fuel, U.S. Energy Information Administration, http://www.eia.gov/petroleum/gasdiesel/.

> and reduced pollution), diesel cars have become attractive to European buyers. They value the fuel-efficiency of diesel, the reliability of the engine and the higher torque.
>
> In contrast, demand for diesel in the US has been higher for domestic purposes (heating) resulting in a lower price difference for diesel at the pump compared to gasoline, which in itself has long been at a much lower price level than in Europe. Also, and as a consequence, the infrastructure for diesel in the US is much less developed. In addition, diesel long suffered from a bad image in the US.[6]

By using a different combustion system, diesel engines attain better fuel economy than their gasoline counterparts. In addition, a gallon of diesel fuel contains about 10% more energy than a gallon of gasoline. These two factors help diesel light vehicles travel one-third further on a gallon of fuel than their gasoline-powered counterparts. For example, a Volkswagen Jetta diesel is rated as having a combined city/highway fuel efficiency of 34 miles per gallon (mpg) under U.S. government standards, whereas a gasoline-powered Jetta has combined efficiency of 25 mpg. The difference in those cars' ratings for highway driving is more pronounced: the diesel Jetta gets 42 mpg and the gasoline version 29 mpg.[7]

The way the United States and Europe regulate diesel emissions is another differentiating factor that makes it unattractive to manufacturers to sell diesel cars designed for the European market in the United States.

# Fuel Efficiency Standards

The United States, Japan, and the European Union each has its own standards for vehicle fuel efficiency and emissions, regulations that affect the type of vehicles sold in each market. In the past, countries have regulated fuel efficiency directly by setting numeric standards for fuel usage, such as miles per gallon. More recently, the relationship between greenhouse gas (GHG) and fuel consumption has become a focal point, because carbon dioxide ($CO_2$) is a major source of GHG emissions from motor vehicles. Automobile GHG emissions standards are likely to be expressed in terms of grams of $CO_2$ equivalent per vehicle mile. Methods of testing for fuel efficiency and GHG emissions differ among countries.[8]

Although the United States was the first country to establish fuel economy standards for passenger cars, those standards remained little changed until recently while other countries have tightened their fuel efficiency or GHG standards.[9] By 2006, Europe and Japan had the world's most stringent standards, both requiring roughly 40 mpg. The use of diesel engines is an

[6] European Automobile Manufacturers' Association (ACEA), *Diesel Market Highly Developed in Europe*, http://www.acea.be/news/news_detail/diesel_market_highly_developed_in_europe/.

[7] As rated by EPA and the Department of Energy, both are model A-S6, 2.0L, 4cyl. The estimated annual fuel cost for the gasoline Jetta is $2,250 and $1,750 for the diesel version. EPA and Department of Transportation, *Fuel Economy Guide*, 2012, p.11, http://www.fueleconomy.gov/feg/pdfs/guides/FEG2012.pdf.

[8] Feng An, Robert Earley, and Lucia Green-Weiskel, *Global Overview on Fuel Efficiency and Motor Vehicles Standards: Policy Options and Perspectives for International Cooperation*, United Nations Department of Economic and Social Affairs, Background Paper No. 3, May 2011, pp. 3-4, http://www.un.org/esa/dsd/resources/res_pdfs/csd-19/Background-paper3-transport.pdf.

[9] Accurate comparisons are difficult because countries often have different requirements for whether an engine is started cold or warm, the speed at which it is tested, how many miles it is run, and other matters related to the testing process.

important reason vehicles sold in Europe are more fuel efficient, on average, than those sold in the United States.[10] Diesel light vehicles, however, have not gained popularity in Japan, and account for a relatively small share of Japanese light vehicle production.

In the United States, fuel efficiency is governed by the Corporate Average Fuel Economy (CAFE) standards administered by the National Highway Traffic Safety Administration (NHTSA), part of the U.S. Department of Transportation. NHTSA sets the standards with which vehicles sold in the United States must comply, and the Environmental Protection Agency (EPA) oversees the testing.[11]

Vehicle testing to determine U.S. fuel efficiency is conducted by automakers in their own controlled laboratory settings using a standardized procedure specified under federal statute. This self-certification process, whereby manufacturers determine their vehicles' fuel efficiency and then report the findings to EPA, differs from the procedures used in Japan and Europe, where government agencies conduct the testing. Although EPA reviews the automakers' results and confirms them through its National Vehicle and Fuel Efficiency Laboratory, the U.S. system is based primarily on self-certification.

In addition to having different procedures, the fuel efficiency requirements themselves differ. **Table 1** shows the main elements of fuel efficiency standards in the United States, Japan, and the European Union.

**Table 1. Minimum Fleet Average Fuel Economy Standards**

(Passenger cars)

| Region | 2006 | 2009 | 2020 (Targets) |
|---|---|---|---|
| European Union | 40 mpg | 42 mpg | 57.6 mpg |
| Japan | 37.6 mpg | 38.3 mpg | 47.7. mpg |
| United States | 27.5 mpg | 27.5 mpg | 44.6 mpg |

**Sources:** EU data are from the UN Environmental Programme (UNEP); US data from National Highway Traffic Safety Administration; and Japan data from Japan Automobile Manufacturers Association (JAMA).

**Notes:** Direct comparisons are difficult because standards in each country are based on vehicle attributes (such as vehicle or engine size). Similarly, compliance tests vary from country to country. A key part of vehicle testing is the kind of driving cycle used to duplicate on-road driving patterns and conditions. Also, countries often have different requirements for whether an engine is started cold or warm, the speed at which they are tested, how many miles they are run, etc. The test cycle used in the United states is the EPA Highway/City cycles, in Europe is the New European Drive Cycle (NEDC), and in Japan the JC08 cycle.

# Emissions Standards

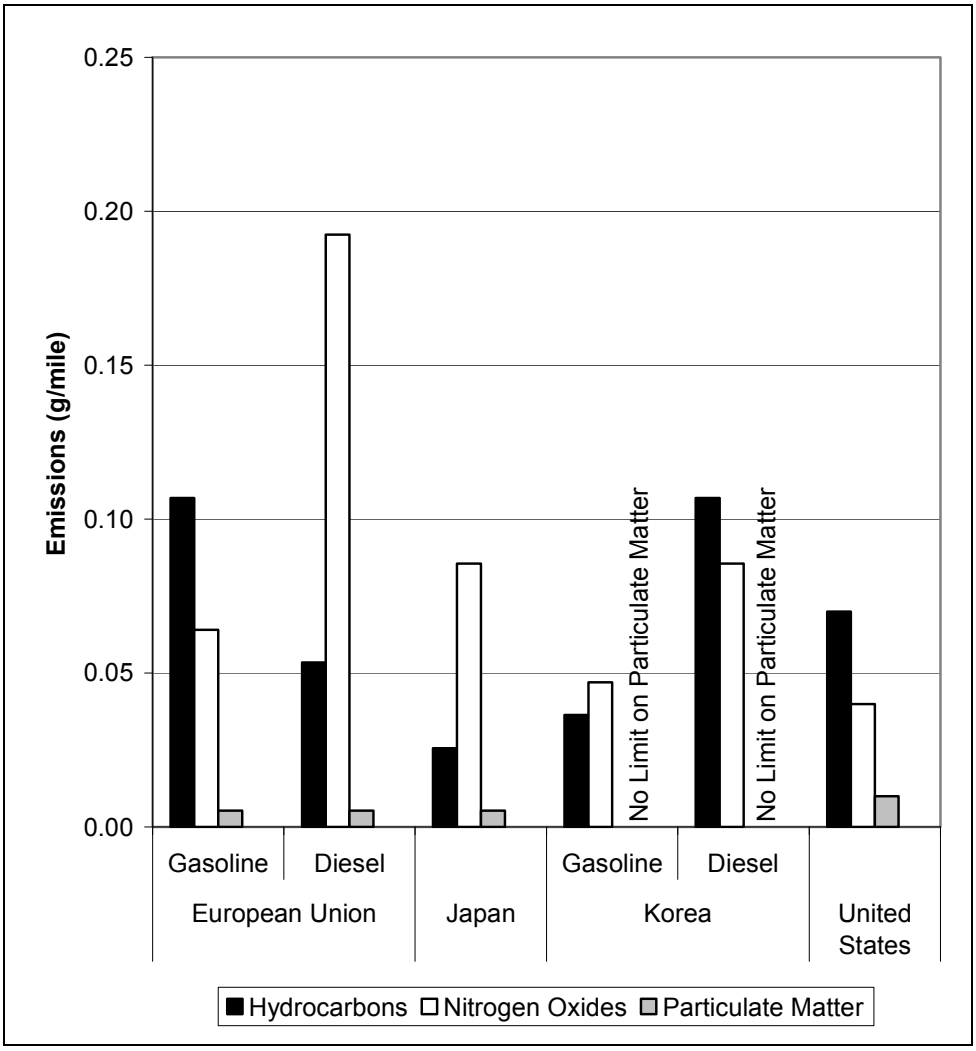
Differing emissions standards around the world also have a significant impact on what types of vehicles are sold. **Figure 1** shows how some of the major pollutants are regulated in major auto-producing countries. Japan has the most stringent per-mile standards for hydrocarbon emissions,

[10] United Nations Environmental Programme (UNEP) and the Global Fuel Economy Initiative (GFEI), *The European Union Automotive Fuel Economy Policy*, http://www.unep.org/transport/gfei/autotool/about.asp.

[11] "CAFE-Fuel Economy," NHTSA, http://www.nhtsa.gov/fuel-economy.

whereas the United States has more stringent standards for nitrogen oxides. Further, the European Union (and South Korea) have separate standards for gasoline and diesel vehicles, whereas Japan and the United States have one standard applicable to both types of vehicles. Thus, designing a vehicle's emissions system for one country will likely make that vehicle, in a different country, under-compliant for some pollutants and over-compliant for others.

**Figure 1. Emissions Standards for Selected Pollutants in Various Countries**




**Source:** Delphi Customer Technology Center Luxembourg, *Worldwide Emissions Standards: Passenger Cars & Light Duty Trucks 2010/2011*,Bascharage, Luxembourg 2010. Ecopoint, Inc., *Dieselnet: Emissions Standards*, Mississaugua, ON, http://www.dieselnet.com/standards/.

**Notes:** Smaller bars indicate more stringent standards. Larger bars indicate less stringent standards.

Because of the different requirements, importing a car may require additional engineering and new or different parts, and generally requires new vehicle emissions testing and certification under the importing country's system. This may entail significant investment, which may not be economical if expected sales of the vehicle are low.

Automakers sell diesel models in Europe that have high fuel economy, but which are not marketed in the United States. For example, Ford builds a high fuel economy diesel engine in

Great Britain for the ECOnetic, a small car that gets as much as 71 mpg by U.S. standards, but has a fairly small engine (1.6 litre). Ford executives reportedly believe that two factors make a North American version of the Fiesta ECOnetic uneconomical. The car would have to be redesigned to comply with U.S. and Canadian standards, and the market is perceived as too small to recoup the estimated $350 million it would cost to expand its Mexican engine plant to make engines compliant with U.S. and Canadian standards.[12]

Volkswagen recently opened a plant in Chattanooga, TN, where it manufactures gasoline- and diesel-powered Passat models for sale in the United States. The gasoline model of the Passat built in Tennessee has a larger engine (either a 2.5 litre or 3.6 litre engine) compared with its European versions (with 1.4 and 1.8 litre engines), reflecting the American preference for larger engines. Volkswagen is building a diesel Passat in Tennessee, but for commercial reasons it has decided to use a 2.0 litre diesel engine, which has lower fuel efficiency than the 1.6 or 2.0 litre versions it uses in Passats sold in Europe.[13]

## Conclusion

There is nothing in U.S. emissions or fuel economy regulations that prevents automakers from marketing high-efficiency diesel cars in the United States. Volkswagen and others already offer a few models domestically. To meet U.S. emissions standards, however, automakers have to modify their EU-certified diesel engines. Where a manufacturer sees large demand for diesel vehicles in the United States, it is free to do so. However, the U.S. market for diesels is very small. Most Americans have shunned this technology because of some adverse experiences with diesel engines more than 30 years ago, as the European Automobile Manufacturers' Association noted.[14] Current diesel engine technology has changed markedly since then, but there appears to be a lingering bias against such vehicles by U.S. consumers, reinforced by the fact that, unlike in Europe, in the United States, diesel fuel is more expensive than gasoline. As a result, automakers have determined that it would be uneconomical for them to invest in technology to bring their high-efficiency diesel vehicles into compliance with U.S. emissions standards, as they believe the market for those vehicles would be small.[15]

[12] Darren Quick, "Ford's Most Fuel Efficient Passenger Car Ever," *Gizmag*, March 25, 2012, http://www.gizmag.com/ford-fiesta-econetic-technology/21943/.

[13] VW engine data sourced from Volkswagen's U.S. and European websites.

[14] In 1998, U.S. diesel vehicle sales accounted for about 0.1% of all vehicle sales, rising to 0.5% in 2009. United Nations Environmental Programme (UNEP) and the Global Fuel Economy Initiative (GFEI), *The European Union Automotive Fuel Economy Policy,* p. 2 and *The U.S. Automotive Fuel Economy Policy*, p. 1.

[15] In some cases, individuals may import foreign vehicles into the United States. EPA maintains a process for emissions certification of imported vehicles. Information is available on EPA's website: http://www.epa.gov/oms/imports/documents/420b10027.pdf.

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