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U.S. and EU Motor Vehicle Standards: Issues for Transatlantic Trade Negotiations

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Summary

In March 2013, President Obama notified Congress that his Administration would seek a comprehensive Transatlantic Trade and Investment Partnership (TTIP) with the European Union (EU). In addition to addressing tariffs and other trade restrictions, the negotiations seek to reduce regulatory barriers to transatlantic commerce. Among the barriers under discussion are those affecting motor vehicles. Although many automakers build and sell cars in both regions, they must comply with very different safety, fuel economy, and emissions standards, as well as different regulatory processes. TTIP negotiators are seeking to identify ways to narrow the regulatory differences, potentially reducing costs and spurring additional trade in vehicles. U.S. and EU automakers support this initiative, which they see as furthering economic and vehicle design trends already under way. The complexity of complying with different greenhouse gas emissions regulations is also a factor in the industry's support.

This report looks at ways in which TTIP might lead to a convergence of motor vehicle regulatory regimes on both sides of the Atlantic. These regimes govern three distinct aspects of vehicle manufacturing and involve a number of U.S. and EU agencies.

- **Safety.** U.S. automakers self-certify that they are meeting U.S. vehicle standards. In Europe, vehicles must obtain "type approval" from a government before an automaker can bring out a new model.
- **Emissions.** U.S. and EU emissions regulations are administered by the U.S. Environmental Protection Agency (EPA) and the European Commission (EC), respectively. While U.S. and EC rules address a similar range of pollutants, including carbon monoxide, nitrogen oxide, and non-methane organic oxides, allowable emissions levels in the EU are different from those in the United States—and they are stricter in more than a dozen U.S. states than in the other states. The United States and the EU have similar "type approval" systems for new engine models.
- **Fuel Efficiency.** Auto manufacturers selling in the United States must meet the Corporate Average Fuel Economy (CAFE) standards enforced by the National Highway Traffic Safety Administration (NHTSA). Under the Obama Administration, greenhouse gases (GHG) in vehicle emissions are being regulated for the first time, making fuel economy standard-setting a joint venture between NHTSA and EPA. The EU does not directly set fuel economy standards, but it effectively does so by regulating greenhouse gas emissions of new vehicles.

There are several different ways a TTIP agreement could promote convergence of automobile regulation, from harmonizing existing U.S. and EU rules to providing for mutual recognition of some or all automotive standards. If a TTIP agreement is reached, it will be subject to congressional approval. To the extent that such an agreement would require changes in motor vehicle regulatory processes or standards, it is possible that Congress will be asked to modify statutes that govern motor vehicle safety, emissions, and fuel economy.

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Introduction

In November 2011, President Obama and leaders of the European Union (EU) named a High Level Working Group on Jobs and Growth to recommend steps to broaden transatlantic economic ties. In its final report, issued in February 2013, the working group called for a new bilateral agreement to govern transatlantic trade and investment. Such an agreement, the working group urged, should provide for "the promotion of more compatible approaches to current and future regulation and standard-setting and other means of reducing non-tariff barriers to trade."[1]

One month later, President Obama notified Congress that the United States would enter into negotiations with the EU to seek a free trade agreement, referred to as the Transatlantic Trade and Investment Partnership (TTIP). The negotiations, the President wrote, would

> seek greater compatibility of U.S. and EU regulations and related standards development processes, with the objective of reducing costs associated with unnecessary regulatory differences and facilitating trade, *inter alia* by promoting transparency in the development and implementation of regulations and good regulatory practices, establishing mechanisms for future progress, and pursuing regulatory cooperation initiatives where appropriate.[2]

The formal TTIP negotiations began in July 2013.[3] Motor vehicle safety and emissions standards are areas where the United States and the EU could break new ground.[4] Trade in vehicles and parts between the United States and the EU reached $57 billion in 2012,[5] and numerous companies manufacture on both sides of the Atlantic. The major U.S. and European motor vehicle manufacturer associations have called for TTIP to provide for mutual recognition of existing technical standards and the creation of a U.S.-EU process for harmonization of future vehicle regulations. Such steps, an industry alliance has contended, would "increase trade, lower costs, create jobs and improve the international competitiveness of the industry" in both North America and Europe.[6] The alliance estimates that current non-tariff barriers on vehicles are equivalent to a 26% tariff on vehicle imports. It projects that elimination of tariffs[7] and just 10% of non-tariff

[1] U.S.-EU High Level Working Group on Jobs and Growth, *Final Report*, February 11, 2013, http://trade.ec.europa.eu/doclib/docs/2013/february/tradoc_150519.pdf, p. 2.

[2] Letter from Demetrios Marantis, Acting United States Trade Representative, to Honorable John Boehner, Speaker of the U.S. House of Representatives, March 20, 2013, http://www.sice.oas.org/TPD/USA_EU/Negotiations/03202013_TTIP_Notification_Letter.PDF.

[3] For general information on the negotiations, see CRS Report R43158, *Proposed Transatlantic Trade and Investment Partnership (TTIP): In Brief*, by Shayerah Ilias Akhtar and Vivian C. Jones.

[4] President Obama issued Executive Order 13563 on January 18, 2011, laying out guidelines for pursuit of international regulatory cooperation, http://www.whitehouse.gov/the-press-office/2012/05/01/executive-order-promoting-international-regulatory-cooperation.

[5] Joint statement of the American Automotive Policy Council (AAPC) and European Automobile Manufacturers' Association (ACEA), *U.S-EU Automotive Regulatory Convergence*, and statement of the Alliance of Automobile Manufacturers, at the U.S.-EU High Level Regulatory Cooperation Stakeholders Forum, Washington, DC, April 11, 2013, p. 6, http://www.uschamber.com/sites/default/files/grc/AAPC-ACEA%20Joint%20Presentation%20at%20Regulatory%20Cooperation%20Forum%20April%2011,%202013%20FINAL%20PDF.pdf and http://www.autoalliance.org/index.cfm?objectid=EFFAD010-A2AD-11E2-9CE9000C296BA163.

[6] Ibid., p. 4.

[7] The U.S. tariff on passenger cars is 2.5%, and on pickup trucks, 25%. The EU tariff is 10% on passenger cars and 22% on pickup trucks, http://usitc.gov/publications/docs/tata/hts/bychapter/1301c87.pdf (for U.S. tariff schedule) and http://export.gov/logistics/eg_main_018130.asp (for EU tariff schedule).

barriers could raise U.S. vehicle and parts exports to the EU by over 200% and EU parts and vehicle exports to the United States by 71%.[8]

Safety, fuel efficiency, and emissions standards differ between the two regions (see **Table 1**), due to historical differences in producer and consumer preferences as well as the role of government in industry practices. The United States and the EU have different standards even for an item as simple as a seat belt. Some of these differences may reflect past efforts to protect domestic vehicle industries against foreign competition, and others may result from different legal traditions or divergent views as to the best way of achieving goals such as cleaner air and reduced oil consumption.

Table 1. Comparison of Major U.S. and EU Motor Vehicle Regulatory Differences

	United States	European Union
Self-certification for safety regulations	•	
Type approval for safety regulations		•
Government labs used for all testing		•
Type approval for emissions	•	•
Mutual recognition of regulations by other countries[a]		•
Government sets fleet fuel economy standards	•	
Fuel economy standard (miles/gallon)		
In 2016	34.1	n/a
In 2020	38.9	n/a
Government sets emissions standards	•	•
Emissions standards for pollutants (grams/mile):		
Nitrogen oxides (NOx)	.07	.10/.29[b]
Non-methane organic gases (NMOG)	.09	.11/.14[b]
Carbon monoxide (CO)	4.2	0.8
Greenhouse gases (GHG, in 2016)	250	208
Greenhouse gases (GHG, in 2020)	213	152
Form of vehicle emission testing	FTP[c]	NEDC[d]

Source: CRS analysis.

Notes: In the EU, gasoline and diesel standards differ.

a. Through UNECE, the EU provides mutual recognition to other countries. The United States does not.

b. Gasoline and diesel standards.

c. Federal Test Procedure, described later in the report.

d. New European Drive Cycle.

Past auto agreements have been effective in leading to a more globalized auto industry. The 1965 motor vehicle agreement between the United States and Canada and the 1994 North American Free Trade Agreement (NAFTA) removed barriers to trade and cross-border trade in autos and established a more regional motor vehicle industry in the process. The Trans-Pacific Partnership,

[8] AAPC and ACEA, *U.S.-EU Automotive Regulatory Convergence*, U.S.-EU High Level Regulatory Cooperation Stakeholders Forum, Washington, DC, April 11, 2013, p. 8.

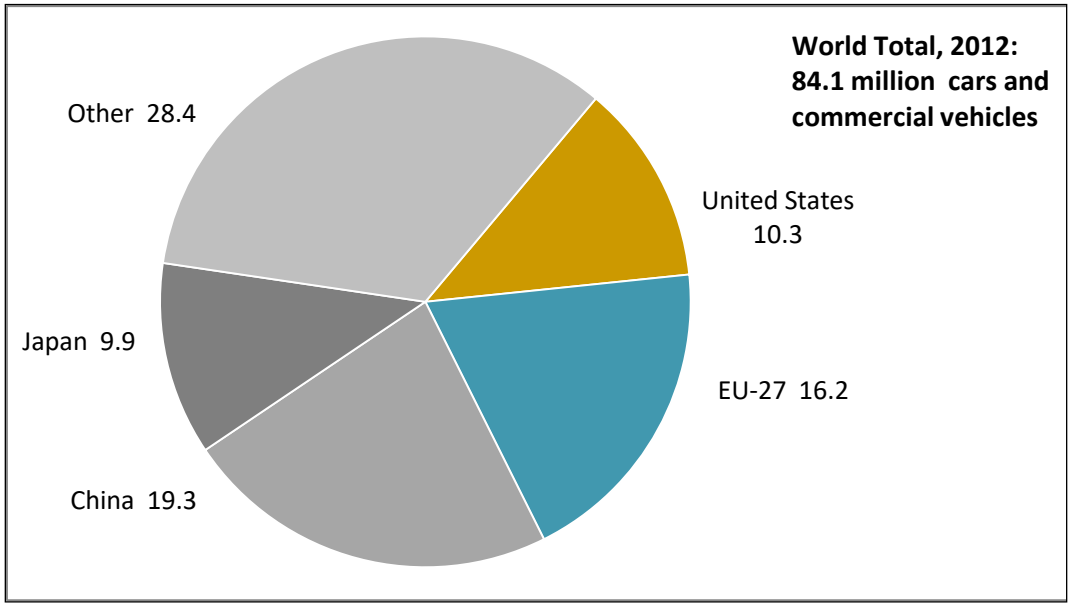
a separate negotiation involving the United States and 11 other Pacific Rim countries, could have a similar effect. With respect to the auto industry, TTIP represents another effort to extend these regional templates to encompass a greater share of trade and investment.

U.S.-EU Vehicle Trade

The EU and the United States are the second- and third-largest vehicle producers in the world (see **Figure 1**), together accounting for nearly one-third of global auto production. In 2012, the EU 27[9] produced more than the United States—16.2 million vehicles compared to 10.3 million.[10] Sales in each region were about the same in 2012: 14.8 million vehicles sold in the United States and 14.3 million in the EU. The remainder of EU production was exported, much of it to the U.S. market.

Figure 1. Major Global Auto Producing Regions

million cars and commercial vehicles, 2012



Source: International Organisation of Motor Vehicle Manufacturers, "World Motor Vehicle Production by Country and Type," http://www.oica.net/wp-content/uploads/2013/03/total-production-2012.pdf.

Note: "Other" includes Mexico and Canada.

Seventeen of the EU member states manufacture vehicles. Germany is by far the largest auto producer within the EU (see **Figure 2**). The five top countries—Germany, Spain, France, United Kingdom and Czech Republic—manufacture more than 76% of all vehicles produced in the EU. In the United States, vehicles are manufactured in 15 states.[11]

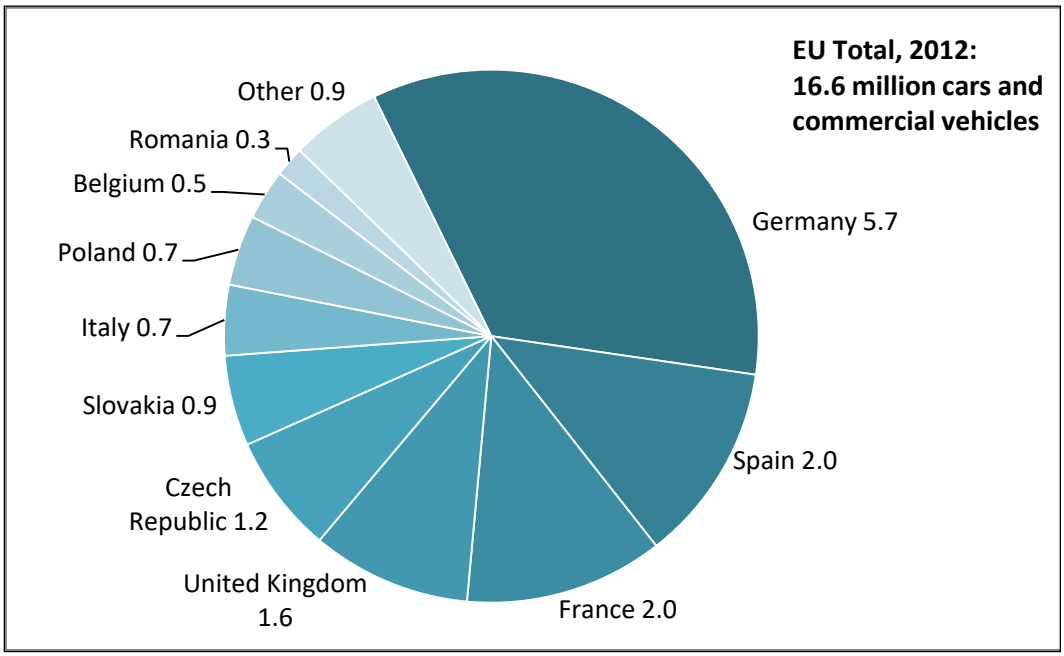
[9] The 28th country to join the EU was Croatia on July 1, 2013. Data cited in this report cover the EU 27. For a full list of EU members, see http://europa.eu/about-eu/countries/.

[10] China produced over 19 million vehicles in 2012.

[11] Alabama, Georgia, Illinois, Indiana, Kansas, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Ohio, Tennessee, Texas and South Carolina. *Automotive News* data. U.S. imports are vehicles made outside of North America.

Figure 2. Major EU Vehicle Producers

million cars and commercial vehicles, 2012



Source: International Organisation of Motor Vehicle Manufacturers, "World Motor Vehicle Production by Country and Type."

Note: OICA data for France are for 2011.

Unlike some consumer goods, such as computers and apparel, most vehicles are sold in the region where they are produced because of local consumer preferences and vehicle standards. In 2012, imports constituted about 20% of U.S. sales,[12] and about 17% of sales in the EU.[13]

In some cases, a vehicle that is entirely legal in one country may not be sold in another due to differing fuel efficiency, safety, and emissions standards, unless the manufacturer is willing to make major investments to bring the vehicle into compliance. For example, Ford Motor Company's ECOnetic high-efficiency diesel engine, made in Great Britain, gets up to 71 miles per gallon (mpg) of fuel. This engine is not sold in North America because it does not comply with U.S. and Canadian emissions standards. Ford has determined that expanding its Mexican engine plant to make a redesigned version of the ECOnetic for North America would cost $350 million, and it does not believe consumer demand justifies the expenditure. [14]

Increasingly, however, auto manufacturers and their parts suppliers have sought to organize their production on a global basis. The German automaker BMW, as an example, produces sport utility vehicles for markets worldwide from a plant in South Carolina. Greater commonality in regulation would make it easier for automakers and parts makers to coordinate production across

[12] *Automotive News* data. U.S. imports are vehicles made outside of North America.

[13] EU data is for 2011. David Coffin, *Passenger Vehicles: Industry and trade Summary*, U.S. International Trade Commission, Publication ITS-09, Washington, DC, May 2013, p. 62, http://www.usitc.gov/publications/332/working_papers/pub_ITS_09_PassengerVehiclesSummary5211.pdf.

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

major markets. This is consistent with individual companies' efforts to reduce costs with new design and production plans, such as the following:

- **Reducing platforms.** Automakers are developing global vehicle platforms[15] that will reduce the number of models sold around the world, while consolidating suppliers and cutting costs. For example, the new Jeep Cherokee and Dodge Dart are based on Fiat's Compact Wide platform.[16] The Ford Focus was developed in Europe but is built with similar components in the United States, China, Germany, Russia, and Thailand and sold in 130 countries.[17]
- **Joining forces to meet tightening world emission standards.** Many countries, including the United States, have adopted new standards that will be costly for manufacturers to meet. Automakers have responded by creating partnerships to develop more powerful batteries, multispeed transmissions, techniques to improve engine efficiency, and other technological advances.[18] Along these lines, BMW and Toyota have agreed to jointly develop fuel cell technology.[19]
- **Growing U.S. interest in diesel-powered vehicles.** About half of all the passenger cars sold in Europe have diesel engines, which are more efficient than gasoline engines and emit a lower level of some greenhouse gases. Many automakers believe that offering diesels (as well as higher-performing gasoline, electric, and hybrid vehicles) will be necessary to meet higher U.S. fuel efficiency and greenhouse gas emissions standards currently projected between now and 2025. Having similar standards for diesel engines in the two regions could reduce design and manufacturing costs.

How the United States and the EU Set Standards

The processes by which the United States and the EU establish vehicle safety, fuel efficiency, and emission standards have evolved in different ways. In the United States, private standards and state regulation prevailed until the 1960s and 1970s, when federal legislation was passed. Since then, Congress has delegated vehicle regulation to federal agencies, occasionally providing specific direction through legislation. In Europe, a system of governmental control over autos was more prevalent, first in each country and later through the EU. EU directives passed by the European Parliament have the force of regulations, thereby vesting the legislators with a more direct role in the regulatory process than is the case in the United States.

[15] A vehicle platform is the core architecture in a vehicle. Global platforms will include the use of the same or similar components and subsystems, such as a steering rack. The automakers' supply chains may change as well to supply global platforms, with suppliers providing similar parts for vehicles manufactured in North America, Europe, Asia and Latin America.

[16] David Sedgwick, "Global Platforms Prompting Supplier Shakeout," *Automotive News*, August 6, 2013.

[17] David Kiley, "Why Ford Focus is the New No. 1 Car in the World," *AOL Autos*, April 10, 2013.

[18] Jeff Bennett and David Pearson, "Car Makers Join Forces to Pare Exhaust Gases," *Wall Street Journal*, January 25, 2013.

[19] "Peugeot and GM Change Alliance Plan," *Euronews*, December 20, 2012.

Safety Standards

Evolution of U.S. Safety Standards

In the early decades of the automobile, U.S. vehicles were lightly regulated by a combination of state and private sector standards. While one industry magazine called for national motor vehicle standards as early as 1902, it did so mainly to reassure would-be buyers of the structural integrity these new, little-understood machines.[20] Writing about this era, one author noted that

> Regulating either driver conduct or vehicle design at the national level did not conform to existing political ideas about the appropriate federal division of responsibilities or to contemporary jurisprudential understandings of the federal government's constitutional power to regulate interstate commerce.... The only useful and politically acceptable action Congress might take was to help the states and localities construct more and better roads.[21]

The Society of Automotive Engineers (SAE), a professional association founded in 1905, became the primary source of vehicle safety and emission rules for many decades.[22] State governments often used SAE recommendations to enact requirements for vehicle equipment, such as dual brakes, headlamps, and windshield wipers. Other SAE standards were adopted directly by manufacturers.

The first step toward a nationwide system of vehicle regulation came in 1926, when a voluntary Uniform Vehicle Code was drafted to replace the many different state rules.[23] Among other things, the code specified the types of lighting, reflectors, brakes, mirrors, and tires that cars should have.[24] These ideas were widely accepted by the states: by 1946, 30 of the then 48 states (plus the District of Columbia) had adopted the Uniform Vehicle Code; 13 had implemented portions and only six had taken no action.[25]

With the start of the Interstate Highway system in the 1950s, greater automobile travel, and rising highway deaths, the interest in vehicle safety grew. Between 1962 and 1964, Congress passed three safety bills into law, including a seat belt regulation.[26] These laws set the stage for more

[20] The industry publication *Horseless Age* called for national vehicle standard because so many small producers were making vehicles with "scores of design characteristics" and the public had a limited understanding of these new vehicles that did not use a horse for mobility. Jerry Mashaw and David Harfst, *The Struggle for Auto Safety* (Cambridge, MA: Harvard University Press, 1990), p. 29.

[21] Ibid., pp. 30 and 31.

[22] SAE standards are proposed and vetted through committees that include academics, government and industry representatives, and consultants. Standards that emerge are based on consensus of the committee members and adherence is voluntary for automakers. SAE currently has over 8,000 volunteer members and 550 committees. Over 2,000 of its motor vehicle standards are active and current with the past five years. CRS interview with Jack Pokrzywa of SAE, July 12, 2013.

[23] J. Allen Davis, *The California Vehicle Code and Uniform Vehicle Code*, Vol. 14, Hastings Law Journal, 1963, pp. 377-390. The National Conference on Street and Highway Safety (NCSHS) called for the changes and Public Roads Administration, *Uniform Act Regulating Traffic on Highways*, Act V of the Uniform Vehicle Code, 1945, pp. 30-46.

[24] Public Roads Administration, *Uniform Act Regulating Traffic on Highways*, Act V of the Uniform Vehicle Code, 1945, pp. 30-46.

[25] The state-by-state survey was conducted by a presidential Highway Safety Conference; the Code was updated and reissued in 1956 and 1962. J. Allen Davis, *The California Vehicle Code and Uniform Vehicle Code*, Vol. 14, Hastings Law Journal, 1963.

[26] PL 87-637 required hydraulic brake fluid used in motor vehicles to meet certain standards established by the Secretary of Commerce; PL 88-201 required the Secretary of Commerce to promulgate safety standards for seat belts, and PL 88-514 required vehicle manufacturers to meet certain minimum safety standards for vehicles sold to the General Services Administration (GSA) for the federal fleet.

ambitious legislation a few years later. For example, the legislation establishing safety requirements for federal fleet vehicles led to the promulgation of 17 standards by 1966, prompting some in Congress to question why similar standards did not apply to vehicles purchased by average consumers.[27]

The most significant change in U.S. vehicle safety regulation came with the National Traffic and Motor Vehicle Safety Act of 1966.[28] Senator Abraham Ribicoff, one of the advocates of the new legislation, said during floor debate that "this problem is so vast that the Federal Government must have a role. It is obvious the 50 states cannot individually set standards for the automobiles that come into those 50 States from a mass production industry."[29] Curtailing auto-related highway deaths was a major impetus.[30]

As passed unanimously by both houses of Congress and signed by President Johnson, the legislation had two parts:

- the Highway Safety Act of 1966 mandated that each state put in place a highway safety program in accordance with federal standards that would include improving driver performance, accident records systems and traffic control; and
- the National Traffic and Motor Vehicle Safety Act of 1966 directed the Secretary of Commerce (later changed to the Secretary of Transportation when that agency was established in 1967) to issue safety standards for all motor vehicles beginning in January 1967. A National Traffic Safety Agency was established to carry out the provisions; it was renamed the National Highway Traffic Safety Administration (NHTSA) in 1970.[31]

Senator Warren Magnuson, chairman of the Commerce Committee, argued that Congress was implementing a limited type of regulation, saying in his floor statement,

> The committee also recognizes that the broad powers conferred upon the Secretary, while essential to achieve improved traffic safety, could be abused in such a manner as to have serious adverse effects on the automotive manufacturing industry. The committee is not empowering the Secretary to take over the design and manufacturing functions of private industry. The committee expects that the Secretary will act responsibly and in such a way as to achieve a substantial improvement in the safety characteristics of vehicles.[32]

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[27] Jerry Mashaw and David Harfst, *The Struggle for Auto Safety* (Cambridge, MA: Harvard University Press, 1990), p. 61.

[28] P.L. 89-563. Ralph Nader, whose 1965 book *Unsafe at Any Speed: The Designed-in Dangers of the American Automobile* (New York: Grossman Publishers) argued that cars were unnecessarily unsafe and that the auto industry should be regulated by a federal agency. Also influential was the report *Accidental Death and Disability: The Neglected Disease of Modern Society* (Washington, DC: National Academy of Sciences, 1966), which documented the impact of accidental injuries, including those by motor vehicles. http://www.nap.edu/openbook.php?record_id=9978.

[29] *Congressional Record*, vol. 112, part I (June 24, 1966), p. S14232.

[30] Upon signing the new law, President Johnson cited the 50,000 people killed on U.S. highways as the biggest cause of death and injury among young Americans. The White House, "Remarks of the President at Signing of the Highway Safety Act and the Traffic Safety Act," press release, September 9, 1966, cited in *National Traffic and Motor Vehicle Safety Act of 1966, Legislative History*, Vol. 1, p. 31, published by NHTSA in 1985.

[31] Highway Safety Act of 1970, P.L. 91-605.

[32] Sen. Warren Magnuson, "Traffic Safety Act of 1966," Remarks in the Senate, *Congressional Record*, vol. 112, part I (June 24, 1966), p. S14222.

The U.S. Approval Process

Since it was established, NHTSA has issued dozens of safety standards,[33] and it maintains an extensive database on vehicle crashes.[34] However, the agency neither approves motor vehicles or parts as complying with its standards nor collects information from manufacturers as to compliance. The law puts the onus for enforcement of federal standards on automakers themselves. It provides that "A manufacturer or distributor of a motor vehicle or motor vehicle equipment shall certify to the distributor or dealer at delivery that the vehicle or equipment complies with applicable motor vehicle safety standards prescribed under this chapter.... Certification of a vehicle must be shown by a label or tag permanently fixed to the vehicle ..."[35]

The law also makes manufacturers responsible for testing of vehicles and liable for recalls and penalties if they are later found not to meet NHTSA's standards. After a new model is in the market, NHTSA buys vehicles from dealers and tests them at its own facilities to determine whether they comply with current standards. If NHTSA determines there is noncompliance, it can encourage the manufacturer to recall the model to correct the problem or can order a recall.[36]

EU Vehicle Safety Regulation

In contrast to the U.S. system of self-certification, the comparable EU vehicle system is based on government regulatory approval in advance of manufacturing.

Until the 1950s, European vehicle safety regulations developed separately in each country.[37] Interest in harmonizing vehicle regulation emerged as part of the process of European economic integration.[38] The European vehicle regulatory regime now includes both EU directives, which must be implemented by all member states, and standards promulgated through a United Nations (UN) organization, which may be implemented at the discretion of a national government.

United Nations Agreement

In 1952, the United Nations (U.N.) established the Working Party on the Construction of Vehicles—known as Working Party 29 or WP. 29—a subsidiary body of the Inland Transport

[33] Standards include regulations affecting windshield wipers, hood latches, tires, brakes, seat belts and fuel economy. All NHTSA (and EPA) regulatory actions follow the Administrative Procedure Act of 1946 (APA, 5 U.S.C. §551 *et seq*.) which ensures that proposed rulemaking is publicized in the *Federal Register*, comments are taken and considered and agency decisions are clearly explained. Court review of standards is allowed. Revisions to federal regulations must also follow the APA. For a summary of NHTSA standards, see http://www.nhtsa.gov/staticfiles/ ... /pdf/FMVSS-QuickRefGuide-HS811439.pdf.

[34] NHTSA's work in compiling data about vehicle crashes, fatalities and injuries has become an international resource for traffic safety research. According to NHTSA, no other country has a similar database. Marine Moguen-Toursel, "Emergence and Transfer of Vehicle Safety Standards: Why We Still Do Not Have Global Standards," *Center for Historical Research, Ohio State University*, vol. 5 (2007), p. 4 and CRS interview with NHTSA officials, June 2013.

[35] P.L. 89-563, 49 U.S.C. §30115.

[36] Vann Wilbur and Paul Eichbrecht, "Transatlantic Trade, the Automotive Sector: The Role of Regulation in a Global Industry, Where We Have Been and Where We Need to Go, How Far Can EU-US Cooperation Go Toward Achieving Regulatory Harmonization," German Marshall Fund Academic Policy Research Conference, Ann Arbor, MI, May 8, 2008, pp. 8-9.

[37] European vehicle standards could be quite different from each other. For example, until the early 1990s, a French standard required yellow headlights while other European countries had standardized on white headlights. David W. Moore, *Headlamp History and Harmonization*, The University of Michigan, Transportation Research Institute, UMTRI-98-21, Ann Arbor, MI, June 1998, p. 9.

[38] The 1957 Treaty of Rome established the European Economic Community, often called the Common Market.

Committee of the United Nations Economic Commission for Europe (UNECE).[39] The objective of WP.29 is to "initiate and pursue actions aimed at the worldwide harmonization or development of technical regulations for vehicles."[40] WP.29 administers a 1958 agreement on vehicle construction and two related agreements which were adopted by some European countries to promote EU-wide integration of vehicle design, construction and safety.[41] UNECE standards deal with vehicle safety, environmental protection, fuel efficiency, and anti-theft performance.

Signatories to the 1958 U.N. agreement[42] commit to mutual recognition of approvals for vehicle components, so that a component approved for use in one signatory country will be automatically approved in all others. UNECE regulations do not cover the whole vehicle, only its parts. WP.29's voting members are limited to government representatives, but automakers, trade associations, and other nongovernmental organizations also participate in its meetings.

The United States did not sign the 1958 UNECE agreement because it would require mutual recognition of standards generated outside the United States. After U.S. self-certification began in 1967, the UNECE approach was seen as incompatible with the U.S. process.[43] Because the United States remained outside of UNECE, many U.S.-made vehicles could not be exported to many countries without modifications.[44]

However, the United States did sign a 1998 UNECE agreement which establishes global technical regulations (GTRs), effectively transforming the U.N. body into an organization with a global approach now called the World Forum for Harmonization of Vehicle Regulations.[45] It promulgates regulations affecting vehicle safety, environmental protection, energy efficiency, and anti-theft performance. Unlike the 1958 agreement, there is no requirement for type approval and mutual recognition of approvals. GTRs are issued in a UN Global Registry and contracting parties use their own regulatory process to implement them.[46]

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[39] WP.29 is the regulatory and administrative entity that oversees UNECE activities and agreements, much like NHTSA and EPA administer U.S. vehicle laws and regulations. In March 2000, as its membership expanded beyond Europe, WP.29 became the "World Forum for Harmonization of Vehicle Regulations (WP.29)." U.S. representatives from NHTSA and EPA regularly attend WP.29 meetings.

[40] UNECE website, http://www.unece.org/trans/main/wp29/faq.html.

[41] The 1958 agreement was revised in 1995 to promote the participation of non-European countries. UNECE website, http://www.unece.org/trans/main/wp29/faq.html.

[42] All signatories were European countries until 1995 when the agreement was changed to allow non-UNECE members. http://www.unece.org/trans/main/wp29/faq.html.

[43] UNECE website, http://www.unece.org/fileadmin/DAM/trans/main/wp29/WP29-FAQ-2005.pdf.

[44] Marine Moguen-Toursel, "Emergence and Transfer of Vehicle Safety Standards: Why We Still Do Not Have Global Standards," *Center for Historical Research, Ohio State University*, vol. 5 (2007), p. 8.

[45] The 1998 UNECE agreement was in part the result of the Transatlantic Business Dialogue (TABD) established between the United States and EU in 1995. Vann Wilbur and Paul Eichbrecht, *Transatlantic Trade, the Automotive Sector: The Role of Regulation in a Global Industry, Where We Have Been and Where We Need to Go, How Far Can EU-US Cooperation Go Toward Achieving Regulatory Harmonization*, German Marshall Fund Academic Policy Research Conference, Ann Arbor, MI, May 8, 2008, p. 14.

[46] Since 1998, 13 GTRs have been agreed to, including regulations for vehicle door locks, test procedures for compression-ignition engines, and off-cycle emissions testing, UNECE, http://www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29glob_registry.html.The U.S. approval process for a GTR shows the limitations of harmonization. A GTR for door locks was proposed in 2004, but NHTSA did not adopt the GTR as proposed. Its public hearings produced comments urging changes, and NHTSA incorporated changes it its final rule. UNECE then changed its GTR to align with the U.S. modifications. This process took over eight years. http://www.unece.org/fileadmin/DAM/trans/main/wp29/wp29wgs/wp29gen/wp29registry/ECE-TRANS-180a1am1app1e.pdf.

EU Directives

Alongside UNECE, the European Economy Community (renamed the European Community in 1993) and its successor, the EU, have sought to promote a single European market in motor vehicles. Tariffs on cars traded between member states were eliminated in 1968.[47] In 1970, the European Community enacted a framework[48] that laid the basis for vehicle approval harmonization across all member states.

Initially, European working groups on vehicle safety issues based their work on U.S. standards and practice because the United States had established a federal safety program earlier.[49] It has been suggested that one reason for the slow development of European standards (and hence reliance on the UNECE standards process) was that some European automakers "preferred to limit the extension of standards to those that would create obstacles to the invasion of foreign vehicles into their national markets."[50] Over time, the balance shifted to favor more similarity between U.S. and EU standards.[51]

The EU Approval Process

Since 1970, the EU has used the Whole Vehicle Type Approval system, under which production samples of new model cars must be approved by national government authorities prior to the vehicle entering the market.[52] An automaker must submit the "type" of vehicle it intends to manufacture and sell to the proper authority in any country that is a signatory to the 1958 UNECE agreement. All EU member states enforce the EU standards. EU member states may choose which UNECE standards they wish to incorporate into their national regulations. Unlike the UNECE standards, the EU system applies to a complete vehicle, often taking into account the UNECE standards promulgated for specific auto parts.

Nearly every EU country has either a government agency or designated privately-owned test houses that conduct testing to ensure new models will meet all standards. Once formal approval is obtained, the automaker then issues a "certificate of conformity" for each vehicle manufactured, attesting that it conforms to the approved type.[53] Once an EU member state approves a new vehicle, it can be marketed throughout the EU.[54]

The EU agreed in 2007 that the UNECE regulations would be incorporated into the EU type-approval procedure.[55] Legislative work at the EU level is led by European Commission's

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[47] EU website, "Ten Historic Steps," http://europa.eu/abc/12lessons/lesson_2/index_en.htm.

[48] Directive 70/156/EEC. The goal of EU regulation was initially to further remove internal barriers to the trade in goods and hence the level of environmental protection was secondary. Roland Stephen, *Vehicle of Influence: Building a European Car Market* (Ann Arbor, MI: University of Michigan Press, 2000), pp. 67 and.92.

[49] Ibid., p. 5.

[50] Ibid., p. 17.

[51] Ibid.

[52] The process of introducing such a system for trucks and buses is currently under way. Prior to 1970, there was no whole vehicle Type Approval; automakers needed to seek approval for each component addressed by a standard.

[53] EU, "EC type-approval system for motor vehicles," http://europa.eu/legislation_summaries/internal_market/single_market_for_goods/motor_vehicles/motor_vehicles_technical_harmonisation/n26100_en.htm.

[54] An EU member state that challenges a vehicle's compliance with regulations is required to raise the alleged discrepancy with the government that certified it. The certifying government then works with the manufacturer to address the issue.

[55] EU Directive 2007/46/EC, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:263:0001:0160:EN:PDF.

Directorate of Enterprise and Industry. Vehicle safety promotion is also pursued by the European Commission through initiatives such as DG Transport's EU road safety action program and DG Information and Society's E-safety and Intelligent Car initiatives.

Emissions Standards

Evolution of U.S. Vehicle Emission Standards[56]

Programs to address air pollution in the United States originated in the first half of the twentieth century and were accelerated after World War II. A critical aspect of the air quality problem in urban areas has been ground-level ozone production, commonly referred to as "smog."

Independent analysis in the mid-1950s[57] identified the automobile as a key source of ground-level ozone. Research has since demonstrated that cars and other mobile sources are responsible for a variety of other air pollutants, including carbon monoxide (CO), hydrocarbons (HC), nitrogen oxides (NO_x), particulate matter (PM), air toxics, and greenhouse gases (GHG). Emissions of hydrocarbons and NO_x from motor vehicles are responsible for contributing to the formation of ground-level ozone.[58] Further, motor vehicles represent the largest domestic source of air toxics, or pollutants known or suspected to cause cancer or other serious health or environmental effects.[59] Finally, vehicles have been determined to contribute approximately one quarter of domestic GHG emissions,[60] which trap heat in the earth's atmosphere, contributing to global climate change.[61]

The federal government first addressed air pollution in 1955 in the Federal Air Pollution Control Act, which provided funding to state and local governments to "protect the primary responsibilities and rights of the state and local governments in controlling air pollution."[62] In 1959, California became the first state to address pollution from cars with legislation directing the state Department of Public Health to establish air quality standards and necessary controls for motor vehicle emissions. Following California's lead, in 1960 Congress directed the Surgeon General to study the "various substances discharged from the exhausts of motor vehicles."[63]

This regulatory pattern continued throughout the 1960s, as California authorities established control requirements and the U.S. government followed suit a few years later. For example, California required the control of crankcase emissions in 1961and set the first HC and CO emissions regulations in 1964. The federal Motor Vehicle Air Pollution Control Act of 1965

[56] This historical summary is drawn, in part, from National Research Council, Committee on State Practices in Setting Mobile Source Emissions Standards, *State and Federal Standards for Mobile Source Emissions* (Washington, DC: National Academies Press, 2006).

[57] Haagen-Smit, A.J., and M.M. Fox. "Photochemical ozone formation with hydrocarbons and automobile exhaust," *J. Air Pollut. Control Assoc.*, vol. 4 (1954), pp. 105-109.

[58] For more detail on ozone pollution, see EPA's website at http://www.epa.gov/air/ozonepollution/.

[59] Summaries of research on mobile source air pollutants and explanations of the findings can be found in literature published by EPA's Office of Transportation and Air Quality, http://www.epa.gov/otaq/, as well as in various CRS reports.

[60] Transportation contributed 28% of domestic GHG emission in 2011, as reported by EPA's *Inventory of Greenhouse Gases and Sinks*. For more detail, see http://www.epa.gov/climatechange/ghgemissions/usinventoryreport.html.

[61] This section focusses on conventional pollutants. Greenhouse gas emission standards are surveyed in the section on "Fuel Economy Standards."

[62] P.L. 84-159.

[63] P.L. 86-493.

adopted both the California crankcase and tailpipe emissions standards for 1968 model-year vehicles.[64] This act engaged the federal government for the first time in the actual regulation of vehicle emissions.[65]

Congress's provision for national emissions standards was based primarily on testimonies by the Department of Health, Education, and Welfare (HEW) and the automotive industry about the potential problems that would be created for vehicle manufacturers by divergent state standards.[66] Congress strengthened federal authority in 1967 by explicitly preempting states from adopting or enforcing new motor vehicle emission standards in the Air Quality Act of 1967.[67] This preemption provision (with California as the sole exemption) remains in effect today as Section 209(a) of the Clean Air Act (CAA).[68]

U.S. Vehicle Emission Standards and Implementation[69]

At present, the federal government manages vehicle emissions controls, although the state of California remains a major force in shaping national legislation and regulations. Emission standards for engines and vehicles, including emission standards for greenhouse gases, are currently established by the U.S. Environmental Protection Agency. EPA authority to regulate vehicle emissions—and air quality in general—is based on the Clean Air Act.[70] As with safety regulations, the development of vehicle emission standards by EPA is in accordance with the federal rulemaking process. New regulations are first published as proposed rules, and following a period of public discussion may be withdrawn, approved, or amended before entering into force.

Current EPA emissions standards for vehicles (referred to as "Tier 2" requirements) regulate CO, NO_x, PM, and HC emissions.[71] Under the Tier 2 regulation, the same emission standards apply to all vehicle weight categories, (i.e., cars, minivans, light-duty trucks, and SUVs have the same emission limit). Further, the same emission limits apply to all vehicles regardless of the fuel they use. While a number of U.S. states have a significant legal basis in advancing emissions regulations to aid in their attainment of National Ambient Air Quality Standards (NAAQS),

[64] P.L. No. 89-272, §202(a), 79 Stat. 992, [1965].

[65] Section 202 of the 1965 law authorized the federal government to set "standards, applicable to the emission of any kind of substance, from any class or classes of new motor vehicles or new motor vehicle engines." Congress delegated this new standard-setting authority to the U.S. Department of Health, Education, and Welfare (HEW). The U.S. Environmental Protection Agency (EPA) would not be established until five years later.

[66] Testimony of James M. Quigley, Assistant Secretary of HEW, Hearings before the Subcommittee on Air and Water Pollution of the Senate Comm. on Public Works, 89th Cong., 1st Sess. 33, 1965.

[67] P. L. 90-148, §208, 81 Stat. 485, 501 [1967]. After hearings on this legislation, the Senate found that divergent state standards would result in economic disruption and increased costs to consumers (S.Rept. 403, 90th Cong., 1st Sess. 33 [1967]). The House elaborated that the nature of motor vehicle manufacturing required the consistency and certainty that could be provided only by uniform federal standards (H.Rept. 728, 90th Cong., 1st Sess. 21 [1967]).

[68] 42 U.S.C. §7401 et seq.

[69] Title II of the CAA covers a wide variety of "mobile sources," including vehicles, engines, and equipment, and applies to either "on-road" or highway sources such as cars and trucks and "nonroad" (also called "off-road") sources such as construction and farm equipment. On-road and nonroad sources are further divided into such categories as "light duty vehicles" and "heavy duty vehicles." This discussion focusses on "light duty vehicles," principally passenger cars and light trucks.

[70] P.L. 88-206, and as amended (most recently in 1990).

[71] U.S. Environmental Protection Agency, "Control of Air Pollution from New Motor Vehicles: Tier 2 Motor Vehicle Emissions Standards and Gasoline Sulfur Control Requirements," 65 *Federal Register* 6698-6870, February 10, 2000; as codified in 40 CFR Part 86, "Control of Emissions from New and In-use Highway Vehicles and Engines."

California is the only state vested by the CAA with the authority to develop its own emission regulations if EPA grants the state a waiver. California emission standards are administered by the California Air Resources Board, a regulatory body within the California Environmental Protection Agency. The CAA allows other states a choice between implementing federal emission standards or adopting the California requirements.[72]

The evolution of U.S. emission standards for light-duty, gasoline-fueled vehicles is traced in **Table A-1**of the **Appendix**. "Tier 2" standards—the current regulatory regime—have been in place since 2004. EPA announced proposed Tier 3 standards on March 29, 2013.[73] In addition to exhaust emission standards, U.S. regulations address many other emission-related issues.[74]

U.S. Certification and Test Procedures

Anyone wishing to sell an engine or vehicle within the United States must demonstrate compliance with the CAA and all applicable EPA regulations. This approval process differs from the self-certification used by NHTSA and is closer to the EU type approval system for safety and emissions regulations.

Once EPA sets emission standards for a particular engine and/or vehicle category, manufacturers must produce engines that meet those standards by a specified date.[75] Conformity is determined under test procedures specified by EPA.[76] The most common testing procedure used by EPA is the Federal Test Procedure, as mandated by the Energy Tax Act of 1978.[77] Tests are based on the Urban Dynamometer Driving Schedule [78] to reflect typical driving patterns (e.g., city, highway, aggressive, and use of air conditioning). Currently, EPA uses a three-tiered compliance strategy for light-duty vehicles: (1) pre-production evaluation to certify vehicles prior to sale; (2) a production evaluation on the assembly line for early evaluation of production vehicles, and (3) a final clearance applied to verify that properly maintained vehicles continue to meet the standards after several years of use.

[72] States that have adopted California Clean Car Standards include New Jersey, Connecticut, Washington, Vermont, New York, Maine, Rhode Island, Massachusetts, Oregon, Arizona, Pennsylvania, Maryland, New Mexico, Florida, and the District of Columbia. These standards include the California LEV II and GHG emission standards. For further information on the Clean Air Act and California vehicle emission regulations, see CRS Report RL30853, *Clean Air Act: A Summary of the Act and Its Major Requirements*, by James E. McCarthy and Claudia Copeland.

[73] Links to the proposed Tier 3 standards and related materials are on EPA's website at http://www.epa.gov/otaq/tier3.htm.

[74] The regulations include control of evaporative emissions, fuel vapor emissions from vehicle refueling, emissions durability requirements, emissions warranty, in-use surveillance of emissions performance, and recall of vehicles found not to be in compliance. Regulations that require on-board diagnostic systems that detect and identify malfunctioning emission systems or equipment have also been implemented.

[75] Passenger cars and light-duty trucks are regulated by EPA at the level of the vehicle, whereas many of the heavy-duty vehicle classes are regulated at the engine. Current federal regulations do not require that complete heavy-duty diesel vehicles be chassis certified, instead requiring certification of their engines. As an option, complete heavy-duty diesel vehicles under 14,000 lbs. can be chassis certified.

[76] On January 8, 2014, the House of Representatives passed legislation (H.R. 724) that would eliminate a CAA requirement for auto dealers to certify that new vehicles have an emissions system that complies with the CAA. Vehicles would still be required to meet the CAA standards, but dealers would not have to offer written documentation.

[77] P.L. 95-618.

[78] The Urban Dynamometer Driving Schedule is defined in 40 C.F.R. §86 App I.

EU Vehicle Emission Standards

History[79]

Environmental matters were not included in the EU's founding Treaty of Rome. Prior to the mid-1980s, UNECE produced regulations relating to safety, environmental protection, and energy efficiency. It was a common practice for EU member countries to adopt standards and regulations similar to those issued by UNECE, but each country retained authority to adjust the UNECE standards as it saw fit.

The member states signed the Single European Act (SEA) in 1985 with a goal of unifying the European market by 1992. Under the SEA, auto emissions regulations were harmonized across Europe in 1987. Initially, the harmonized standards were less strict than US standards.[80] Similar to the 1970 U.S. Clean Air Act proviso for California, the SEA allows member states to enact measures more stringent than those enacted by the EU.

EU Vehicle Emission Standards and Implementation

Vehicle exhaust emissions were regulated in Europe beginning in 1970.[81] Directive 70/220/EEC covered CO, NO_x, PM, and HC emissions from gasoline-fueled light-duty vehicles. In June 1991, the Council of Ministers of the European Council adopted the Consolidated Emissions Directive[82] (commonly referred to as "Euro 1") which ushered in the current regulatory regime for vehicle emission standards in Europe. Current standards (referred to as "Euro 5") cover CO, NO_x, PM, and HC emissions, and differentiate between gasoline and diesel vehicles. Euro 6 standards are scheduled to be implemented in September 2014 (strengthening NO_x standards for diesel vehicles). The evolution of EU exhaust emission standards for light-duty, gasoline- and diesel-fueled vehicles is traced in **Table A-2** of the **Appendix.**

EU Certification and Test Procedures

Under the type approval process, emissions are currently tested using the New European Driving Cycle (NEDC) (ECE 15 + EUDC) chassis dynamometer procedure. Effective in 2000 with the Euro 3 standard, the test procedure was modified to eliminate the engine warm-up period before the beginning of emission sampling, bringing the test more in line with the U.S. Federal Test Procedure. Further, the Euro 5/6 implementing legislation introduced a new PM mass emission measurement method which is similar to the U.S. procedure introduced in 2007.

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[79] This historical summary is drawn, in part, from Asif Faiz, et al., *Air Pollution from Motor Vehicles: Standards and Technologies for Controlling Emissions* (Washington, DC: World Bank, 1996), http://www.un.org/esa/gite/iandm/faizpaper.pdf.

[80] Roland Stephen, *Vehicle of Influence: Building a European Car Market* (Ann Arbor, MI: University of Michigan Press, 2000), pp. 21 and 85. The European law on emissions harmonization is Directive 88/76/EEC.

[81] Ibid., pp. 92-93. Until the SEA agreement was reached, the EU based its limited environmental rules on other parts of the Treaty of Rome, such as Article 100 dealing with free movement of goods. These early standards set maximum emissions levels, but each member state could also permit the sale of autos that did not meet those standards within its jurisdiction.

[82] Council Directive 91/441/EEC of 26 June 1991, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31991L0441:EN:HTML.

Comparison of U.S. and EU Vehicle Emission Standards

Vehicle emissions standards established by the EU and the United States are not directly comparable because of the differences in the testing procedures and approval processes.

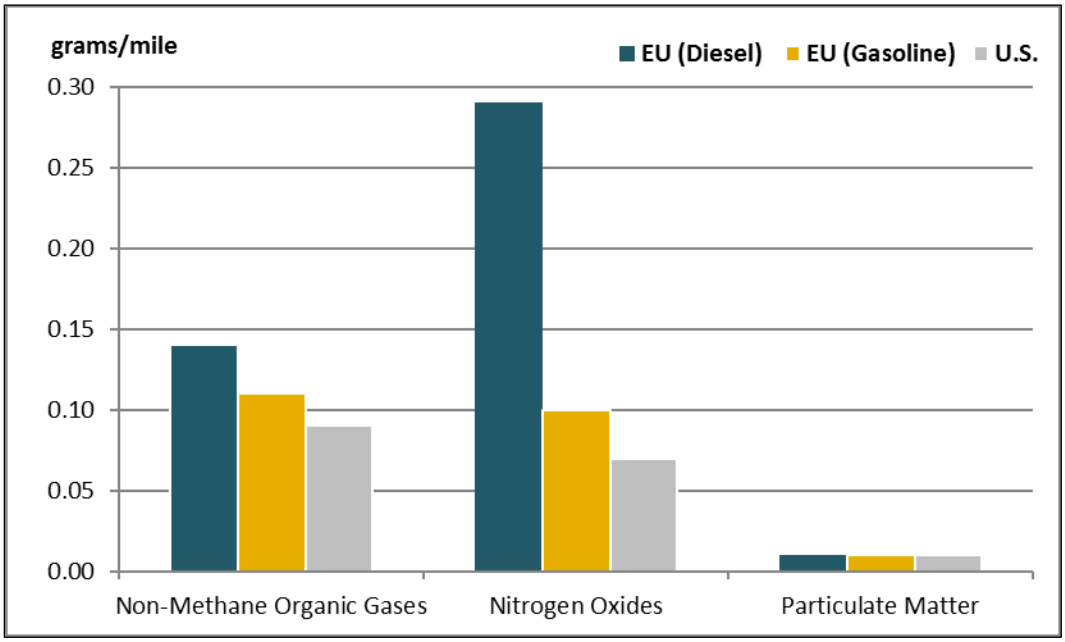
- **Approval Process.** Both the European and the U.S. systems of compliance are based on a version of "type approval." However, in the EU, emission standards only apply when the vehicle is produced (conformity of production). Once the vehicle leaves the factory and enters service, the manufacturer has no liability for its continued compliance with emission limits. Surveillance testing, mandatory emissions system warranties, recall campaigns, and other features of U.S. emissions regulation are not incorporated in the European regulatory structure.
- **Test Procedure.** A key difference between the EU and the United States is the test procedure, in particular the drive cycle that a car has to go through on a roller bench while the exhaust gas is being collected and analyzed. The EU uses the New European Drive Cycle (NEDC) and the United States uses the Federal Test Procedure (FTP). Differences between the two include distance, duration, and vehicle speed, as well as factors such as whether the vehicle must begin at a cold start or whether there is a warm-up period.

In terms of stringency—that is, the level of emission control technology required for compliance—some observers have noted that the European emission standards have historically lagged behind the U.S. standards.[83] This lag may be attributed to the complex, consensus-based approach to standard setting originally used by UNECE and by the difficulty of obtaining agreement among so many individual countries. With the recent shift to decision procedures requiring less-than-unanimous agreement within the European Commission, it has been possible for the Commission to adopt more stringent emission standards. A comparison of current emissions standards for selected pollutants (including non-methane organic gases [NMOG], nitrogen oxides [NOx], and particulate matter [PM]) is shown in **Figure 3.** For a more detailed survey of the standards in each region, see the **Appendix**.

[83] This argument is made in Asif Faiz, et al., *Air Pollution from Motor Vehicles*

Figure 3. Emissions Standards for Selected Pollutants in the United States and EU

non-methane organic gases (NMOG), nitrogen oxides (NOx), particulate matter (PM)
EU standards converted from grams/kilometer to grams/mile



Source: CRS calculations, from U.S. Environmental Protection Agency and European Commission Regulation 715/2007.

Notes: U.S. and EU emissions standards are not directly comparable because of differences in testing procedures and approval processes. This chart shows EPA Tier 2, Bin 5 values for U.S. vehicles tested under the FTP procedure and Euro 5 values for EU vehicles tested under the NEDC procedure. Shorter bars represent more stringent standards.

Fuel Economy and Greenhouse Gas Emission Standards

U.S. Standards Process

In the United States, establishing fuel economy standards is a function of direct statutory authority from Congress, with NHTSA administering the congressionally established standards.

The United States first issued vehicle fuel economy standards in response to the Organization of the Petroleum Exporting Countries (OPEC) oil embargo of 1973, which caused imported crude oil prices to rise by 300% in 1974. In the Energy Policy and Conservation Act of 1975 (EPCA),[84] Congress established Corporate Average Fuel Economy (CAFE) standards for new passenger vehicles starting with model year (MY) 1978. From 1975 to 1988, the average fuel economy of new automobiles increased 81%, from 15.8 to 28.6 mpg. EPCA prohibited states from issuing their own fuel efficiency standards. Prior to 2007, NHTSA had very little authority to modify passenger car standards without congressional direction. However, under the Energy Independence and Security Act of 2007 (EISA)[85]—which raised the fuel economy standards of passenger vehicles, light trucks, and sport utility vehicles to a combined average of at least 35

[84] P.L. 94-163.

[85] P.L. 110-140.

mpg by 2020—Congress granted NHTSA broader authority to establish and modify CAFE standards.

The most significant recent change in fuel economy standards took place outside of the previous channel of congressional action. In 2009, the Obama Administration, some state regulators, and the auto industry crafted a federal program to implement new light duty vehicle fuel efficiency standards linked to greenhouse gas (GHG) emission standards. This agreement grew out of the fuel efficiency standards passed by Congress in 2007, a Supreme Court decision confirming federal authority to regulate greenhouse gas emissions of vehicles under the CAA,[86] and GHG emission standards enacted in California and subsequently adopted by 13 other states and the District of Columbia. The agreement enabled automakers to manufacture vehicles that are in compliance with both federal and state requirements under the Clean Air Act as well as the CAFE standards. The combined CAFE/GHG standards have made standard setting more complex, as NHTSA and EPA issue separate standards but act in concert.

The combined standards call for fleet-average passenger car and light truck GHG emissions of no more than 163 grams per mile by 2025. This translates to average fuel economy of 54.5 mpg.[87] The CO_2 emissions target for any given vehicle depends on its track width (the horizontal distance between the tires) and its wheelbase (the distance from the front to the rear axles); no specific vehicle must meet a specific target, but a manufacturer's fleet average must be below the sales-weighted average of the targets. This measurement procedure allows heavier cars to have higher emissions than lighter cars while preserving the overall fleet average. As a result, each manufacturer will have its own fleet-wide standard which reflects the vehicles it chooses to produce. For a summary of the 2012 CAFE and GHG vehicle standards, see **Table A-3** of the **Appendix**.

The regulation also includes a system of averaging, banking, and trading (ABT) of credits, based on a manufacturer's fleet average CO_2 performance. Credit trading is allowed among all vehicles a manufacturer produces, both cars and light trucks, as well as between companies. Further program flexibilities include Air Conditioning Improvement Credits, Advanced Technology Credits, Off-Cycle Innovative Technology Credits, Early Credits, and Flex-fuel and Alternative Fuel Vehicle Credits.

CAFE and GHG emission certification is typically based on fuel economy and emission data provided by vehicle manufacturers after two laboratory test cycles dictated by EPA. This procedure is sometimes referred to as the EPA 2-cycle test. CAFE values—used to determine manufacturers' compliance with the average fuel economy standards—are generally higher than typical fuel efficiency in real-world operation or as published by the government or posted on new vehicles. This discrepancy reflects the fact that the EPA 2-cycle test is not wholly representative of vehicle operation patterns and technology as well as the fact that CAFE figures can include other credits and flexibilities.

EU Standards Process

The EU does not set fuel economy standards for vehicles directly in terms of fuel consumption for a given distance traveled. Instead, it sets standards for GHG emissions in terms of the mass of

[86] *Massachusetts vs. Environmental Protection Agency*, April 2, 2007, http://www.supremecourt.gov/opinions/06pdf/05-1120.pdf. See CRS Report RS22665, *The Supreme Court's Climate Change Decision: Massachusetts v. EPA*, by Robert Meltz.

[87] For a full description of the new standards, see CRS Report R42721, *Automobile and Truck Fuel Economy (CAFE) and Greenhouse Gas Standards*, by Brent D. Yacobucci, Bill Canis, and Richard K. Lattanzio.

CO_2, measured in grams, emitted from a vehicle's tailpipe per kilometer driven (g/km). These standards can be used to estimate fuel economy for vehicles sold in Europe.[88]

The first carbon dioxide emission targets for new passenger cars in Europe were set in 1998-99 through voluntary agreements between the European Commission and the automotive industry.[89] These agreements targeted fleet-average CO_2 emissions of 140 g/km by 2008-09. While significant CO_2 emission reductions were achieved in the initial years, after 2004 the manufacturers failed to meet their targets through voluntary actions. In response, the Commission developed a mandatory CO_2 emission reduction program, and CO_2 emission targets for new passenger cars were adopted in April 2009.[90] The regulation established a fleet-average CO_2 emission target of 130 g/km by 2015 and defined a long-term target of 95 g CO_2/km by 2020.

The standards include incentives for vehicles with CO_2 emissions below 50 g/km and for those running on a mixture of 85% ethanol (E85). Certain flexibilities are available for manufacturers, including credits for technology innovations, pooling between manufacturers, and exemptions for low-volume manufacturers. The regulations cover only CO_2 emissions; other greenhouse gases are not regulated. Emission limits are set according to the mass of vehicle using a fleet-average limit value curve. As with the other EU regulated vehicle emissions, CO_2 emissions are measured over the NEDC test cycle.

Comparison of U.S. and EU GHG and Fuel Economy Standards

The United States regulates the fuel efficiency of each manufacturer's new-vehicle fleet through the CAFE standards, and separately imposes standards for GHG emissions from new mobile sources. The EU does not directly regulate vehicle fuel efficiency, although regulation of GHG emissions pushes manufacturers to achieve greater fuel efficiency.

Comparing vehicle GHG and/or fuel economy standards between the two regions is challenging because these standards differ greatly in structure, form, and underlying testing methods. For example, the EU and the U.S. test cycles differ in terms of average speed, duration, distance, acceleration and deceleration characteristics, and frequencies of starts and stops—all factors which significantly affect the data returned by the tests. Further, the U.S. standard regulates all the GHG emissions from the vehicle (e.g., CO_2, NO_x, CH_4) in terms of CO_2-equivalents; the EU regulates only carbon dioxide emissions. Additionally, the EU sets fleet-average GHG emissions standards in relationship to the mass of a vehicle, whereas the United States sets fleet-average standards based on the vehicle "footprint." Finally, the EU and United States use varying definitions of vehicle categories and weight classes, with proposed targets based on projected sales of vehicles in different size and/or weight classes within each region.

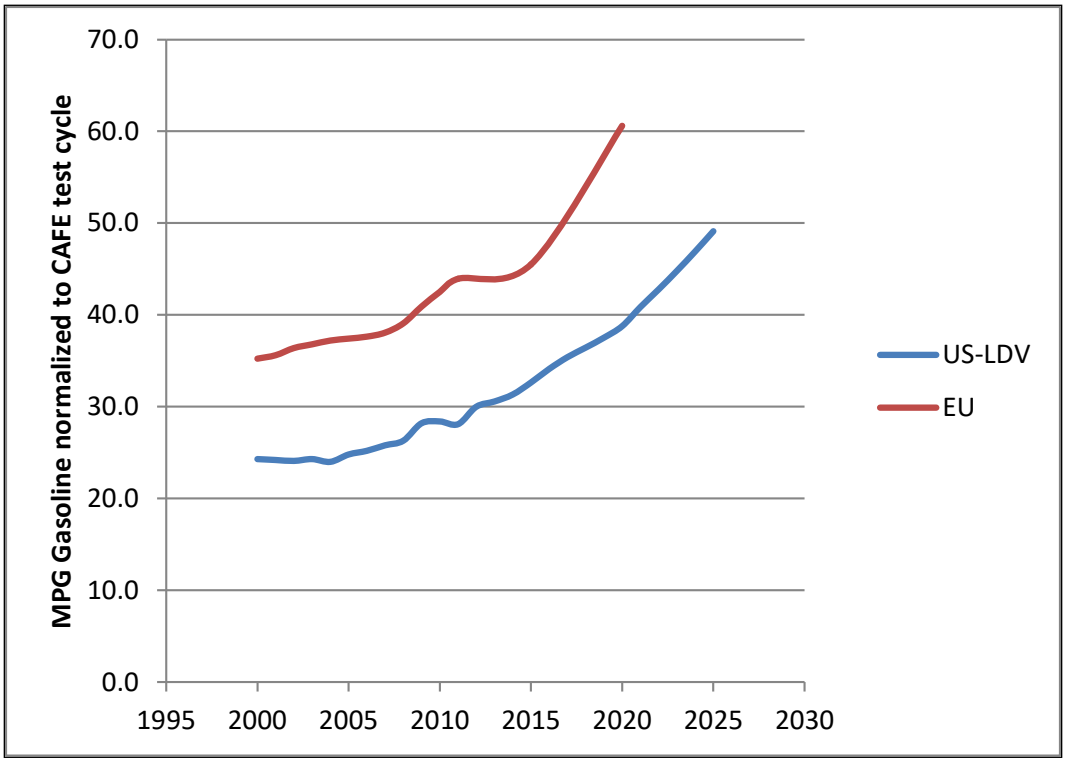
In general the EU GHG standards—and by extension, fuel economy standards—return a greater sales-based and fleet-wide emission reduction than those in the United States. **Figure 4** represents an estimate of historical and projected fuel economy targets, adjusted for the factors outlined above.

[88] An EU Labeling Directive enacted in the 1990s requires each country to place stickers on new vehicles showing that model's projected fuel economy.

[89] For an overview of the European Automobile Manufacturers Association voluntary agreement, see Dieselnet's website at http://www.dieselnet.com/standards/eu/ghg_acea.php.

[90] Regulation (EC) No 443/2009 of the European Parliament and of the Council of 23 April 2009 setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO_2 emissions from light-duty vehicles, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32009R0443:EN:NOT.

Figure 4. Comparison of Historical and Proposed U.S. and EU Fuel Economy Standards for Light-Duty Vehicles



Source: CRS from data sourced at The International Council for Clean Transportation.

Notes: The International Council for Clean Transportation bases these comparisons on datasets generated from (1) current historical regulations and proposals, (2) estimates of fleet-average sales, and (3) test-cycle conversion tools to estimate target test cycles from original test cycles with similar metrics. For more on the comparative methodology, see http://theicct.org/info-tools/global-passenger-vehicle-standards.

The Role of Nongovernmental Organizations (NGOs)

In the United States and the EU, NGOs play a role[91] in the setting of vehicle standards, including these entities:

- **Society of Automotive Engineers (SAE)** remains involved in developing recommended standards for industry and has issued or updated about 2,000 motor vehicle standards in the past five years. Many address manufacturing processes, not auto safety or emissions. About 10% of NHTSA and EPA standards are based on work SAE has already done and, in those cases, NHTSA and EPA rules are based on the specific SAE standards.[92]

[91] SAE and ISO not only develop standards but also have a commercial interest in seeing them used; these organizations copyright their standards and sell them to automakers that want to build vehicles meeting the specifications.

[92] SAE estimate. The inclusion of SAE standards in federal regulations is a shortcut at the time a federal regulation is established. In the long-term, SAE can more readily update and change its standards as technology changes, while NHTSA and EPA must use an extensive public review process.

- **International Organization for Standardization (ISO)** was founded in 1947 and develops voluntary international standards for many products and services.[93] Standards are typically developed through negotiation in technical committees comprising representatives of many countries. ISO has developed nearly 20,000 standards across a range of industries. For example, a 2010 ISO standard addressed automotive crankshaft bearings.
- **International Electrotechnical Commission** (IEC) is a private organization founded in 1906 that develops and publishes international standards for electrical, electronic, and other related technologies. Its standards are voluntary and based on consensus among government, academic, industry, and consumer representatives. IEC standards related to motor vehicles concern charging system architecture, lithium batteries, and other aspects of electric vehicles.[94]

Various other private-sector advocacy groups are engaged in identifying and publicizing new vehicle standards. In the United States, these include the Insurance Institute for Highway Safety, American National Standards Institute (ANSI), National Safety Council, the Center for Auto Safety, and Advocates for Highway and Auto Safety. In the EU, nonprofit groups such as the European Transport Safety Council and Transport & Environment participate in the EU standard-setting process.[95]

Recent Efforts for Regulatory Convergence

European, U.S. and Japanese auto industry groups[96] sought common regulatory ground in 1996, when they proposed that the United States, the EU, Japan, and UNECE harmonize regulation of five vehicle components, including windshield wipers, defoggers, and seat belt assemblies. They believed that these five components were functionally equivalent, although each was slightly different. The regulatory bodies did not agree to any changes, however, because the data-driven review process made it difficult to prove functional equivalency of even a standard component such as a seat belt.[97]

This experience suggested that obtaining functional equivalency determinations from regulatory agencies might be difficult.[98] An alternative approach was developed in the 1998 UN agreement on global technical regulations, which created a global registry of processes and common technical standards. This initiative, resulting in the creation of the World Forum for Harmonization of Vehicle Regulations, has resulted in agreement on only 13 global technical regulations to date.

Simultaneously, there has been a transatlantic dialogue on autos since the mid-1990s through the U.S.-EU High-Level Regulatory Cooperation Forum. In 1995, President Clinton signed an action

[93] ISO website, *About ISO*, http://www.iso.org/iso/home/about.htm.

[94] IEC website, http://www.iec.ch/about/?ref=menu.

[95] Some of the American NGOs preceded federal regulation of the auto industry and others were founded after federal legislation was enacted in the late 1960s. Similar European organizations began their advocacy after 1990.

[96] American Automobile Manufacturers Association (AAMA), European Automobile Manufacturers Association (ACEA) and Japan Automobile Manufacturers Association (JAMA).

[97] "Transatlantic Trade, the Automotive Sector: The Role of Regulation in a Global Industry, Where We Have Been and Where We Need to Go, How Far Can EU-US Cooperation Go Toward Achieving Regulatory Harmonization," p. 14.

[98] Ibid.

plan which sought to move the United States and Europe toward regulatory conformity and to encourage collaborative testing and certification. The 1996 TransAtlantic Automotive Industry Conference on International Regulatory Harmonization produced a report on the auto sector, including ten principles to guide steps toward convergence. NHTSA sent a report to Congress in April 1997 discussing potential harmonization of U.S. and European side impact standards.[99] A similar bilateral regulatory initiative has been under way since 2011 with Canada.[100]

An EU initiative, the Competitive Automotive Regulatory System for the 21s Century, or CARS 21, has also explored harmonization issues. A 2012 CARS 21 report recommended exploration of ways to bring about "stronger internationalisation of the regulatory environment" related to autos.[101] In 2006, CARS 21 called for gradually replacing some EU laws with UN regulations, and more than 40 EU directives have been replaced with corresponding UN regulations since that time.[102]

Pathways to Convergence

There are different ways in which the United States and the EU could address convergence of automotive regulations under TTIP. These include the following:

- **Harmonization of rules.** Harmonization need not mean having identical rules in both regions. From the viewpoint of auto manufacturers, it means minimizing unnecessary differences in regulations so that a "single vehicle standard can be built to satisfy all requirements."[103]
- **Comprehensive mutual recognition.** This approach would permit automakers to sell vehicles in either market if they meet either a U.S. standard or a standard accepted in the EU. A car certified as compliant with U.S. safety, emission, and fuel efficiency standards would be accepted as compliant in the EU, and vice versa. This approach is how the EU certification process works.
- **Selective mutual recognition.** This approach would identify certain major standards for which TTIP could provide mutual recognition, rather than providing mutual recognition of all standards. U.S. and European automakers have identified occupant crash protection, side impact protection, child restraint systems, and some emissions standards as priorities for selective mutual recognition.
- **Forward-looking rules.** A fourth option would be to forge an agreement on emerging regulations, such as those dealing with electric and fuel cell vehicles, rather than focusing on existing regulations. Under this approach, the United States and the EU would commit to jointly develop standards covering new issues or technologies.

[99] http://www.nhtsa.gov/cars/rules/crashworthy/congrep7.html.

[100] The U.S.-Canada Regulatory Cooperation Council has produced a joint action plan, including efforts to harmonize NHTSA motor vehicle safety standards and share information, technical work, scientific collaboration, and testing related to EPA light-duty vehicle emissions regulations. See http://www.trade.gov/rcc/.

[101] CARS 21 High Level Group, *CARS 21: A Competitive Automotive Regulatory System for the 21st Century*, 2006, p. 8, http://ec.europa.eu/enterprise/sectors/automotive/files/pagesbackground/competitiveness/cars21finalreport_en.pdf.

[102] CARS 21 High Level Group, *Final Report 2012*, European Commission, June 6, 2012, http://ec.europa.eu/enterprise/sectors/automotive/files/cars-21-final-report-2012_en.pdf.

[103] International Organisation of Motor Vehicle Manufacturers (OICA), http://www.oica.net.

The pending free trade agreement between the EU and Canada[104] may influence the direction of TTIP. The full text of the agreement has not been released, but according to an EU statement, "Canada will recognise a list of EU car standards and will examine the recognition of further standards. This will make it much easier to export cars to Canada."[105] The agreement is also said to allow Canadian vehicles to be certified in Canada for the EU market.[106]

Convergence of vehicle standards has potential drawbacks. One aspect pertains to the lack of speed with which governmental agencies—whether in the United States or Europe—can address new technologies and vehicle innovations. The rule-making process is already lengthy, and the need for international coordination could make it even longer. This raises the prospect that technologies that could reduce accidents—such as new types of headlamps that can illuminate the road better without blinding oncoming drivers—may be delayed in reaching the market. Additionally, the EU acknowledges that if vehicle standards become international, there could be less room for legislative scrutiny and for involvement by regional and national interest groups.[107]

U.S. consumer advocacy groups have raised similar concerns, writing U.S. and EU leaders in July 2013 that TTIP "must not limit the United States or the EU (or its member states) from adopting and enforcing standards that provide higher levels of consumer, worker, and environmental protection."[108]

Congress could play an important role if a TTIP agreement contains significant provisions related to auto safety, emissions, and fuel economy regulations. Congress established the U.S. government agencies whose regulations are the focus of the negotiations on automobile standards, and it has retained a strong oversight interest in vehicle safety and emissions. If the TTIP effort to obtain mutual recognition or harmonization affects agencies' authority or changes the ways in which automotive regulations are developed and implemented, Congress may well be asked to modify the underlying statutes that govern motor vehicle safety, emissions, and fuel efficiency.

[104] Comprehensive Economic and Trade Agreement (CETA).

[105] EU, "Facts and Figures of the EU-Canada Free Trade Deal," October 18, 2013, http://europa.eu/rapid/press-release_MEMO-13-911_en.htm.

[106] Government of Canada, *How CETA Will Benefit Canada's Key Economic Sectors*, "New opportunities for Canada's automotive industry," p. 4, http://www.actionplan.gc.ca/sites/default/files/pdfs/final-sectors-eng.pdf. No text of an agreement has been released publicly.

[107] European Commission, *Mobility and Safety: Road Transport*, "Who Regulates Vehicle Safety?" http://ec.europa.eu/transport/road_safety/specialist/knowledge/vehicle/vehicle_safety_policy/who_regulates_vehicle_safety.htm.

[108] http://www.citizen.org/documents/public-citizen-letter-to-obama-alerting-to-tafta-concerns.pdf.

Appendix. Detailed Comparison of U.S. and EU Vehicle Emissions Standards

Emission Standards

U.S. Vehicle Emission Standards and Implementation

The Clean Air Act Amendments (CAAA) of 1990 (P.L. 101-549) established standards to limit tailpipe emissions from new motor vehicles effective in 1994. These Tier 1 standards applied to all new light-duty vehicles, such as passenger cars, light-duty trucks, sport utility vehicles (SUVs), minivans, and pick-up trucks, and covered the four major pollutants (CO, NO_x, PM, and HC [subdivided as Total Hydrocarbons (THC) and Non-Methane Hydrocarbons (NMHC)]). Separate sets of standards were defined for each vehicle category, with more relaxed limits for heavier vehicles. The CAAA also required EPA to study the need for more stringent "Tier 2" emission standards. Subsequently, EPA promulgated "Tier 2" standards on February 10, 2000.[109]

The Tier 2 regulations introduced more stringent numerical emission limits and a number of additional changes that tightened the standards for larger vehicles. Under the Tier 2 regulations, the same emission standards apply to all vehicle weight categories. Further, the same emission limits apply to all vehicles regardless of the fuel they use. Since light-duty emission standards are expressed in grams of pollutants per mile, vehicles with large engines (such light trucks or SUVs) were required to use more advanced emission control technologies than vehicles with smaller engines. To provide flexibility to vehicle manufacturers, the Tier 2 emission standards were structured into eight permanent and three temporary certification levels of different stringency, called "certification bins." Manufacturers had a choice to certify particular vehicles to any of the available bins, but were required to meet a fleet-average requirement for NO_x emissions in any given model year.

U.S. emissions standards are shown in **Table A-1.** (Note that Tables A-1 and A-2 are not strictly comparable because U.S. standards are based on grams per mile and EU standards are based on grams per kilometer.

[109] EPA, "Control of Air Pollution From New Motor Vehicles: Tier 2 Motor Vehicle Emissions Standards and Gasoline Sulfur Control Requirements; Final Rule," 65 *Federal Register* 6698-6870, February 10, 2000.

Table A-1. U.S. Emission Standards for Light Duty Gasoline Vehicles

grams/mile

Model Year	Carbon Monoxide (CO)	Non-Methane Hydrocarbons (NMHC)	Nitrogen Oxides (NO_x)
Pre-1966 (uncontrolled)	80.0	10.6	4.1
1967	34.0	4.1	n/a
1972	28.0	3.4	3.1
1975	15.0	1.5	3.1
1977	15.0	1.5	2.0
1980	7.0	0.41	2.0
1981	3.4	0.41	1.0
1994 (Tier 1)	3.4(4.2)	0.25(0.31)	0.4(0.6)
2004 (Tier 2, Bin 5)	3.4(4.2)	0.075(0.09)	0.05(0.07)

Source: U.S. Environmental Protection Agency, *Emission Standards Reference Guide,* http://www.epa.gov/otaq/standards/index.htm.

Notes: "N/a" denotes not-applicable. Standards are set over the "useful life" of the vehicle, which is defined as 50,000 miles or five years for automobiles. The durability of the emissions control device must be demonstrated over this distance within allowed deterioration factors. Figures in parenthesis apply to a useful life of 100,000 miles for Tier 1, 120,000 miles for Tier 2.

EU Vehicle Emission Standards and Implementation

In June 1991, the Council of Ministers of the European Council adopted the Consolidated Emissions Directive [110] (commonly referred to as "Euro 1") under which exhaust emission standards for all passenger cars, including diesels, were certified. The Council of Ministers has since adopted several stricter revisions to the Euro 1 standards; and, in September of 2014, Euro 6 standards will be introduced.[111]

EU emission limits for each "Euro" stage are summarized in **Table A-2.**

[110] Council Directive 91/441/EEC of 26 June 1991, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31991L0441:EN:HTML.

[111] European Commission, *Euro 5 and Euro 6 - emissions from light duty vehicles,* including Regulation (EC) n° 692/2008 implementing and amending Regulation (EC) n° 715/2007 on type-approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and on access to vehicle repair and maintenance information, http://ec.europa.eu/enterprise/sectors/automotive/environment/euro5/index_en.htm.

Table A-2. Evolution of EU Emission Standards for Passenger Cars

emissions expressed in grams/kilometer

Stage	Year	CO	HC	HC+NO_x	NO_x	PM
			Compression Ignition (Diesel)			
Euro 1	1992	2.72 (3.16)	—	0.97 (1.13)	—	0.14 (0.18)
Euro 2	1996	1	—	0.7	—	0.08
Euro 3	2000	0.64	—	0.56	0.5	0.05
Euro 4	2005	0.5	—	0.3	0.25	0.025
Euro 5	2009	0.5	—	0.23	0.18	0.005
Euro 6	2014	0.5	—	0.17	0.08	0.005
			Positive Ignition (Gasoline)			
Euro 1	1992	2.72 (3.16)	—	0.97 (1.13)	—	—
Euro 2	1996	2.2	—	0.5	—	—
Euro 3	2000	2.3	0.2	—	0.15	—
Euro 4	2005	1	0.1	—	0.08	—
Euro 5	2009	1	0.068	—	0.06	0.005
Euro 6	2014	1	0.068	—	0.06	0.005

Source: TransportPolicy.net, http://transportpolicy.net/index.php?title=EU:_Light-duty:_Emissions.

Notes: Standards listed are for EU Category M_1. Values in brackets are conformity of production (COP) limits. HC values for Euro 5 and Euro 6 are for NMHC.

Fuel Economy and Greenhouse Gas Standards

U.S. Fuel Economy and GHG Standards and Implementation

The 2012 CAFE and GHG vehicle standards call for combined passenger car and light truck greenhouse gas emissions of no more than 163 grams per mile by 2025. This translates into a 54.5 mile-per-gallon equivalent.[112] The GHG standards are based on CO_2 emissions-footprint curves, where each vehicle has a different CO_2 emissions compliance target depending on its "footprint" value, related to the size of the vehicle—an approach first introduced in the reformed CAFE (2008-2011) standards for light trucks. **Table A-3** shows the projected fleet-wide CO_2 emission and fuel economy requirements. The EPA CO_2-equivalent fuel economy figures are different from the CAFE figures because the EPA allows additional CO_2 credits for air conditioning improvements and other flexibilities.

Table A-3. MY2016-MY2025 Combined Passenger Car and Light Truck GHG and CAFE Standards

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GHG Standard (grams/mile)[a]	250	243	232	222	213	199	190	180	171	163

[112] For a full description of the new standards, see CRS Report R42721, *Automobile and Truck Fuel Economy (CAFE) and Greenhouse Gas Standards*, by Brent D. Yacobucci, Bill Canis, and Richard K. Lattanzio.

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GHG-Equivalent Fuel Economy (miles per gallon equivalent)[a]	35.5	36.6	38.3	40.0	41.7	44.7	46.8	49.4	52.0	54.5
Fuel Economy (CAFE) Standard (miles per gallon)[a]	34.1	35.4	36.5	37.7	38.9	41.0	43.0[b]	45.1[b]	47.4[b]	49.7[b]

Source: EPA and NHTSA, *2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards*, Prepublication Version, August 28, 2012.

a. Because of the complexity of the CAFE/GHG system, these numbers are based on projected sales of vehicles in different size classes. The standards are size-based, and the vehicle fleet encompasses large, medium, and small cars and light trucks. Thus if the sales mix is different from projections the achieved CAFE and GHG levels would be different. For example, the CAFE numbers are based on NHTSA's projection using the MY2008 fleet as the baseline. A newer projection, based on the MY2010 fleet, leads to somewhat lower numbers (roughly 0.3—0.6 mpg lower for MY2017-2020 and roughly 0.7-1.0 mpg lower for MY2021 onward).

b. Projected. NHTSA has authority only to set CAFE standards in five-year increments. Thus, only rules through MY2021 have been finalized. For MY2022 onward NHTSA must issue a new rule, which has not been proposed as of September 2012.

In addition to the fleet-average CO_2 emission targets, the rule also includes emission caps for tailpipe nitrous oxide and methane emissions (N_2O: 0.010 g/mile and CH_4: 0.030 g/mile). The regulation also includes a system of averaging, banking, and trading (ABT) of credits, based on a manufacturer's fleet average CO_2 performance. Credit trading is allowed among all vehicles a manufacturer produces, both cars and light trucks, as well as between companies.

EU GHG Standards and Implementation

The EU does not issue fuel economy standards similar to the U.S. CAFE standards. As shown in **Table A-4**, EU fleet-average CO_2 emission targets as required by EU Regulation (EC) No 443/2009 are 130 g/km to be reached by 2015 and a long-term target of 95 g/km to be reached by 2020.

Table A-4. EU Light Duty Vehicle GHG Targets

in U.S. CAFE miles per gallon equivalent converted from EU g/km GHG emissions

	2015	2020
GHG Standard (grams/kilometer)	130 g/km	95 g/km
GHG-Equivalent Fuel Economy (miles per gallon equivalent)	45.5 mpg	60.6 mpg

Source: CRS from data provided by International Council for Clean Transportation.

Notes: The International Council for Clean Transportation bases these comparisons on datasets generated from (1) current historical regulations and proposals, (2) estimates of fleet-average sales, and (3) test-cycle conversion tools to estimate target test cycles from original test cycles with similar metrics. For more on the comparative methodology, see http://theicct.org/info-tools/global-passenger-vehicle-standards.

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