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Volkswagen, Defeat Devices, and the Clean Air Act: Frequently Asked Questions

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Summary

The German automotive manufacturer Volkswagen Automotive Group (VW) has admitted to installing a software algorithm in several of its diesel-fueled vehicle engines that acts as a "defeat device": the software detects when the vehicle is undergoing compliance testing and activates certain pollution control devices to reduce tailpipe emissions. During normal driving situations, however, the control devices are turned off, resulting in higher emissions of nitrogen oxide (NO_x) and other air pollutants than claimed by the company. Federal and California regulators and the European Union (EU) have examined the use of this software, which was reportedly installed in 11 million vehicles worldwide.

A summary of federal and state actions includes the following:

- September 18, 2015: the U.S. Environmental Protection Agency (EPA) issued a notice of violation (NOV) of the Clean Air Act (CAA) to VW, contending that 2.0 liter Volkswagen and Audi diesel cars (model years 2009-2015) include software that circumvents EPA standards for NO_x, allowing emissions up to 40 times the standard.
- November 2, 2015: EPA issued a second NOV alleging that VW installed defeat devices in light-duty diesel vehicles equipped with 3.0 liter engines for model years 2014-2016, resulting in NO_x emissions increases nine times the EPA standard.
- January 4, 2016: the U.S Department of Justice (DOJ) filed a civil complaint against VW on behalf of EPA in federal court alleging that nearly 600,000 diesel vehicles had illegal defeat devices installed, thereby impairing emissions controls and causing harmful air pollution in excess of EPA standards.
- EPA stated that it will not grant a certificate of conformity for VW's model year 2016 diesel vehicles, thus halting sales of these vehicles in the United States.
- The California Air Resources Board initiated an investigation into VW's use of this "defeat device," and, on January 12, 2016, issued a NOV to VW, alleging that "approximately 75,688 California vehicles do not conform to State law."
- June 28, 2016: EPA, the state of California and the Federal Trade Commission (FTC) announced a settlement with VW with regard to its 2.0 liter vehicles, including a $10 billion buyback of affected cars from consumers, and $4.7 billion to mitigate pollution and support zero emission vehicle technology.

This report is organized as a series of frequently asked questions. It focuses on a description of modern diesel technologies, their market and emissions profiles, and some potential reasons that could underlie the use of defeat devices. It summarizes the specific allegations filed against VW under the CAA, the current status of federal and state investigations, and the civil and potential criminal penalties that may result. Further, the report introduces several outstanding issues currently under debate, including whether EPA has sufficient resources to monitor vehicle emissions, whether the current penalty structure is sufficient, why EPA failed to detect VW's defeat device when there have been similar cases in the past, and whether VW's response to the emissions problem and efforts to provide restitution to U.S. customers have been adequate.

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Introduction

The German automotive manufacturer Volkswagen Automotive Group (VW)[1] has admitted to installing a software algorithm in several of its diesel-fueled vehicle engines that acts as a "defeat device": the software detects when the vehicle is undergoing official compliance testing and activates certain pollution control devices to reduce tailpipe emissions. During normal driving situations, however, the control devices are turned off, resulting in higher emissions of nitrogen oxides (NO_x) and other air pollutants than claimed by the company. Such software could allow higher on-road performance and fuel economy than otherwise attainable with fully active emissions systems. Federal and California regulators examined the use of this software—reportedly installed in 11 million vehicles worldwide from model years (MY) 2009 to 2016—and announced a $14.7 billion partial settlement in June 2016. The European Union (EU) is also examining the use of the software.

Allegations Against Volkswagen

What Actions Has the U.S. Government Taken Against VW?

On September 18, 2015, the U.S. Environmental Protection Agency (EPA) issued a notice of violation (NOV)[2] to VW, contending that Volkswagen and Audi vehicles with 2.0 liter diesel engines (MY2009-MY2015) include software that circumvents EPA emissions standards for nitrogen oxide (NO_x) emissions. EPA stated that when the emissions equipment is disabled, NO_x emissions are up to 40 times greater than the standard. The California Air Resources Board (CARB) also initiated an investigation into VW's use of this "defeat device."[3] These allegations cover roughly 499,000 diesel passenger cars sold in the United States.

Following the September 18 notice to VW, EPA initiated testing of all U.S. 2015 and 2016 light-duty diesel models to detect potential defeat devices. On November 2, 2015, EPA issued a second NOV alleging that VW installed defeat devices in light-duty diesel vehicles equipped with 3.0 liter engines for MY2014-MY2016, resulting in NO_x emissions nine times the EPA standard. This notice affects 85,000 vehicles sold since MY2009.[4]

[1] The allegations discussed in this report were against a number of related entities, including Volkswagen AG; Audi AG; Volkswagen Group of America, Inc.; Volkswagen Group of America Chattanooga Operations, LLC; Dr. Ing H.c. F. Porsche AG; and Porsche Cars North America, Inc. The report refers to these related entities collectively as "Volkswagen Automotive Group" or "VW."

[2] EPA, "EPA, California Notify Volkswagen of Clean Air Act Violations," press release, September 18, 2015, http://yosemite.epa.gov/opa/admpress.nsf/a883dc3da7094f97852572a00065d7d8/dfc8e33b5ab162b985257ec40057813b!OpenDocument.

[3] CARB, "ARB Letter to VW," September 18, 2015, http://arb.ca.gov/newsrel/in_use_compliance_letter.htm.

[4] EPA, "EPA, California Notify Volkswagen of Additional Clean Air Act Violations," press release, November 2, 2015, http://yosemite.epa.gov/opa/admpress.nsf/0/4A45A5661216E66C85257EF10061867B, and EPA, "United States Files Complaint Against Volkswagen, Audi and Porsche for Alleged Clean Air Act Violations," press release, January 4, 2016, http://yosemite.epa.gov/opa/admpress.nsf/bd4379a92ceceeac8525735900400c27/ac7b52362207dad785257f300060442e!OpenDocument.

The U.S. Department of Justice (DOJ) filed a civil complaint on behalf of EPA in federal court on January 4, 2016.[5] DOJ alleged that nearly 600,000 diesel vehicles had illegal defeat devices installed, thereby impairing emissions controls and causing harmful air pollution in excess of EPA standards. The complaint also alleged that VW violated the Clean Air Act (CAA)[6] by selling vehicles that are designed differently from what it stated in applications for certification to EPA and CARB. DOJ sought injunctive relief and the assessment of unspecified civil penalties; other legal remedies may be pursued as well, such as criminal charges. Parties have settled regarding some of these legal remedies, while others remain unresolved.

How Were the Alleged Emissions Violations Brought to the Attention of EPA?

EPA and CARB were alerted to the emissions violations by researchers at West Virginia University (WVU) working under a contract with the International Council on Clean Transportation (ICCT), a nonprofit environmental research organization. As part of a study of on-road emissions from diesel vehicles, the WVU researchers found emissions levels for some vehicles far exceeded U.S. certification standards. The study was part of a larger investigation by ICCT motivated by reports that some European-made diesel vehicles had passed emissions tests but had much higher real-world NO_x emissions. (EU emissions standards apply only at the time a vehicle is produced; surveillance testing, mandatory emissions system warranties, and other features of U.S. rules are not incorporated in EU regulations.)

According to the EPA notice, VW initially indicated that the excess emissions resulted from a software problem that could be addressed by a voluntary recall. Ultimately, EPA found that software installed in the vehicles' computers sensed when the vehicles were being tested and activated a lower-emissions mode. Thus, nonstandard testing was necessary to reveal VW's actions. Such software could circumvent the "diesel dilemma," discussed below, and allow higher on-road performance and fuel economy than otherwise attainable with fully active emissions systems. WVU's testing indicated a BMW diesel vehicle was able to meet emissions targets. Thus, emissions compliance does not appear to be one of technical feasibility. It should also be noted that while ICCT has found other diesel vehicles that exceed European or U.S. NO_x standards in real-world use, VW is so far the only automobile manufacturer accused of using defeat devices.

What Is the Technology at Issue? What Is a TDI Diesel?

Diesel engines are internal combustion engines that use heat generated by fuel compression to ignite the diesel fuel.[7] Gasoline-powered engines use spark plugs and other components to ignite the fuel, fire the pistons, and drive the car. Otherwise, gasoline and diesel engines are similar. Diesel fuel—which is of a different chemical composition and contains more energy per unit of volume than gasoline—combined with compression ignition[8] is potentially a more energy-

[5] DOJ, "United States Files Complaint Against Volkswagen, Audi and Porsche for Alleged Clean Air Act Violations," press release, January 4, 2016, http://www.justice.gov/opa/pr/united-states-files-complaint-against-volkswagen-audi-and-porsche-alleged-clean-air-act.

[6] 42 U.S.C. §§7401-7671q.

[7] The process is called compression ignition. Andrew Norman, John Corinchock, and Robert Scharff, *Diesel Technology* (Tinley Park, Illinois: The Goodheart-Willcox Company, 1998), p. 3.

[8] It has been estimated that diesel engines convert about 40% of their fuel energy into useable vehicle energy, compared with only 25% fuel efficiency in gasoline vehicles. Ibid., p. 13.

efficient process and in general delivers more power than gasoline. The 2015 EPA *Fuel Economy Guide* notes that

> Diesel engines are inherently more energy-efficient, and diesel fuel contains roughly 10%–15% more energy per gallon than gasoline. In addition, new advances in diesel engine technology have improved performance, reduced engine noise and fuel odor, and decreased emissions of harmful air pollutants. Ultra-low sulfur diesel fuels also help reduce emissions from these vehicles.[9]

Diesel engines generally last longer than gasoline engines and retain a higher resale value. However, diesel engines are more expensive to manufacture than gasoline engines and retail for more.[10] They generally emit greater quantities of NO_x and particulate matter (PM) that require pollution control devices not found on gasoline vehicles.

Diesel engine technology has changed in recent years as automakers have sought to find new ways to raise fuel economy and reduce emissions so they can meet new federal (and EU) greenhouse gas standards. Providing direct injection of fuel into the engine combustion chamber and turbocharging the air used to burn the fuel[11] are two ways in which the goals of higher fuel efficiency and lower emissions can be met. VW's technology is called Turbocharged Direct Injection (TDI).[12] Similar technology is found on other diesel-fueled passenger cars.[13]

What VW Vehicles Are Affected?

The motor vehicles that had defeat devices installed were all diesels manufactured in Europe or the United States. It has been estimated that about 584,000 diesel passenger cars sold in the United States since MY2009 are equipped with a defeat device. See **Table 1** for affected vehicles. EPA did not grant certificates of conformity for VW's MY2016 diesel vehicles, thus halting sales of these vehicles in the United States.[14]

[9] Diesel vehicles' fuel economy is seen in EPA's comparative vehicle ratings: a 2.0 liter, model year (MY) 2015 diesel Jetta gets 31 miles per gallon (mpg) in the city and 45 mpg on the highway, for a combined 36 mpg. A 2.0 liter gasoline-powered Jetta gets 24 mpg in the city and 32 on the highway, for a combined 27 mpg. EPA and Department of Energy, *Model Year 2015 Fuel Economy Guide*, November 19, 2015, pp. 13 and 29; https://www.fueleconomy.gov/feg/pdfs/guides/FEG2015.pdf.

[10] A 2015 VW Jetta's MSRP (manufacturer's suggested retail price) was $20,760; the MSRP for the TDI diesel version of the Jetta was $26,665; http://www.edmunds.com and http://www.edmunds.com/volkswagen/jetta/2015/diesel.

[11] A turbocharger increases the amount of air supplied to the engine at higher than normal pressure, using a turbine powered by exhaust gases. This process improves both combustion efficiency and power output. Isuzu Motors Limited, *Technology for Cleaner Diesel: CO_2 Reduction Technologies*, http://www.isuzu.co.jp/world/technology/clean/cleaner01.html.

[12] Volkswagen, *Technical Glossary*, TDI, http://en.volkswagen.com/en/innovation-and-technology/technical-glossary/tdi.html.

[13] The diesel-fueled Chevrolet Cruze sedan's technology is called Clean Turbo Diesel; http://www.GM.com.

[14] As reported in the September 18, 2015, NOV.

Table 1. VW Automotive Group Vehicles Affected by EPA Notices of Violation

2.0 Liter	3.0 Liter
Jetta (MY2009-MY2015)	Touareg (MY2009-MY2016)
Jetta Sportwagen (MY2009-MY2014)	Porsche Cayenne (MY2013-MY2016)
Beetle and Beetle Convertible (MY2013-MY2015)	Audi A6 Quattro (MY2014-MY2016)
Audi A3 (MY2010-MY2015)	Audi A7 Quattro (MY2014-MY2016)
Golf (MY2010-MY2015)	Audi 8 (MY2014-MY2016)
Golf Sportwagen (MY2015)	Audi 8L (MY2014-MY2016)
Passat (MY2012-MY2015)	Audi Q5 (MY2014-MY2016)
Audi A3 (MY2010-MY2013, MY2015)	Audi Q7 (MY2014-MY2016)

Source: EPA, http://www2.epa.gov/vw.

Note: MY refers to "model year."

What Is VW's U.S. Market?

Volkswagen is a German company established in 1933, with manufacturing operations around the world. In 2015, VW was the world's second-largest automaker after Toyota. In the United States, VW manufactures passenger vehicles at its Chattanooga, TN, plant, which opened in 2011. This is VW's second U.S. manufacturing facility: a Pennsylvania plant operated from 1978 until 1987, when it was closed because of decreasing sales. The Passat, reconfigured from the original European model as a larger vehicle for the U.S. market, has been manufactured with both gasoline and diesel engines at the Tennessee plant.[15]

The resumption of U.S. manufacturing is part of VW's strategy to significantly increase U.S. sales.[16] In 2014, the VW Group sold nearly 600,000 vehicles in the United States, of which 48% were produced in the United States and Mexico. VW Group's total U.S. market share in 2014 was almost 4%. **Figure 1** shows how the total U.S. sales of VW's light vehicles (gasoline and diesel-powered), including the Volkswagen, Audi, Bentley, Porsche, and Lamborghini brands, compared with those of other automakers in 2014.[17]

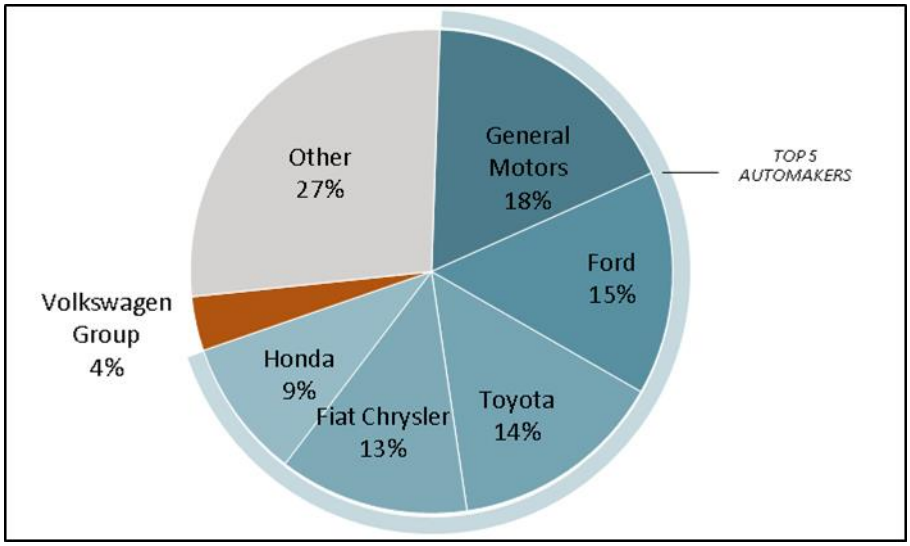
[15] Volkswagen of America, press release, August 27, 2014, https://media.vw.com/release/830/.

[16] Robert Wright, "VW emissions scandal leaves US strategy in tatters," *Financial Times*, October 7, 2015, http://www.ft.com/cms/s/0/f9f055da-695d-11e5-a57f-21b88f7d973f.html#axzz3sKksjtoE.

[17] Diesel-powered passenger cars accounted for about 3% of all U.S. auto sales in 2014. VW's Jetta, Passat, and Golf models accounted for more than half. Matthew Chambers and Rolf Schmitt, *Diesel-powered Passenger Cars and Light Trucks*, Bureau of Transportation Statistics, U.S. Department of Transportation, October 2015, http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/bts_fact_sheets/oct_2015/html/entire.html.

Figure 1. U.S. Light Vehicle Sales

2014



Source: Congressional Research Service, with data from *Automotive News* Data Center.

Note: In 2014, 16,522,663 light vehicles were sold in the United States. Light vehicles include passenger cars, SUVs, crossover vehicles and pick-up trucks.

Are Other Diesel Vehicles Implicated?

Diesel-fueled vehicles manufactured by other automotive companies have not been implicated, but EPA has announced it will expand its testing protocols to sample these vehicles to assess their compliance with CAA standards.[18]

The Clean Air Act and Vehicle Emissions

What Federal Law or Regulation Has VW Allegedly Violated?

In the civil complaint filed on January 4, 2016, DOJ alleged that VW violated several provisions of CAA Section 203 (42 U.S.C. §7522).

In general, the CAA outlines a schedule by which EPA is to establish and update emissions standards for pollutants that affect public health or welfare. Under Section 202, as amended, the EPA Administrator is required to set emissions standards for new motor vehicles:

> The Administrator shall by regulation prescribe (and from time to time revise) in accordance with the provisions of this section, standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare.[19]

[18] EPA, "Letter to Auto Manufacturers," September 25, 2015, http://www.epa.gov/sites/production/files/2015-10/documents/cd-mfr-guid-ltr-2015-09-25.pdf. EPA's European counterparts are reportedly undertaking similar reviews.

[19] 42 U.S.C. §7521(a)(1).

Section 203, as amended, specifies the prohibited acts with respect to the emissions standards. DOJ alleged that VW violated Section 203(a)(1) regarding the sale of vehicles not covered by a certificate of conformity; Section 203(a)(3)(B) regarding the installation of defeat devices; and Section 203(a)(3)(A) regarding tampering with emission control devices.

Emissions standards for new motor vehicles have been strengthened numerous times since the first federal rulemaking took effect in 1968. The most recent revisions, referred to as the "Tier 2" standards, were promulgated in February 2000.[20] Tier 2 required vehicle manufacturers to reduce tailpipe emissions of several common pollutants, including carbon monoxide (CO), formaldehyde (HCHO), NO_x, non-methane organic gases (NMOG, a class of volatile organic compounds (VOCs)), and particulate matter (PM). Relative to the prior Tier 1 standards, the fleet-average standard for NO_x required vehicle manufacturers to reduce overall tailpipe emissions by 88% to 95% (based upon the vehicle type).[21]

What Are the Concerns Regarding Diesel Emissions?

Emissions from diesel fuel combustion contribute to air pollution, including nitrogen dioxide (NO_2), ground-level ozone (O_3), and fine particulate matter ($PM_{2.5}$). Exposure to these pollutants can lead to serious health effects, including increased asthma attacks and other respiratory illnesses. Exposure to O_3 and $PM_{2.5}$ has also been tied to premature death stemming from respiratory and cardiovascular failure. Children, the elderly, and people with respiratory diseases may be especially vulnerable to these pollutants.[22]

Why Are Diesel Emissions Hard to Control?

Diesel engines offer the possibility of combining very high efficiency with a high energy content fuel, resulting in greater fuel economy and lower carbon dioxide emissions. The main problem areas for diesel-fueled engines—compared to gasoline-powered engines—are emissions of NO_x and PM. Engine design often involves a tradeoff, accepting greater emissions of one of these two pollutants in return for tighter control of the other. This trade-off is often referred to as the "diesel dilemma."[23] As summarized by researchers at the University of California—Davis, "the challenge for engine manufacturers is to reduce both NO_x and particulates, and retain diesel's superior fuel efficiency."[24]

Under earlier U.S. standards, diesel vehicles were permitted higher NO_x emissions, as is the case in the EU and elsewhere. However, in 1999, under EPA's "Tier 1" standards, the agency adopted a "fuel neutral" approach to emissions controls, requiring vehicles to attain the same standards

[20] The Tier 2 revisions are found in EPA, "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.

[21] New "Tier 3" standards are scheduled to take effect starting in MY2017. For more information, see CRS Report R43497, *Tier 3 Motor Vehicle Emission and Fuel Standards*.

[22] For more detail on O_3 and $PM_{2.5}$ pollution and control, see CRS Report R43092, *Ozone Air Quality Standards: EPA's 2015 Revision*, and CRS Report R42934, *Air Quality: EPA's 2013 Changes to the Particulate Matter (PM) Standard*.

[23] For more detail on the emissions trade-off, see John Pignon, "Diesel Engines: Designs and Emissions," *Platinum Metals Review*, Volume 49, Number 3 (2005), p. 119. "Very high temperatures in the combustion chamber help reduce the emission of [PM] but produce higher levels of nitric oxide (NO). Lowering the peak temperatures in the combustion chamber reduces the amount of NO produced but increases the likelihood of [PM] formation."

[24] Christie-Joy Brodrick, Daniel Sperling, and Harry A. Dwyer, "Overcoming Noxious Fumes: Are Diesel Engines Part of the Problem or Part of the Solution?," *Access*, vol. 19 (Fall 2001), p. 19, http://webcache.googleusercontent.com/search?q=cache:SqiilUgU7tsJ:www.its.ucdavis.edu/wp-content/themes/ucdavis/pubs/download_pdf.php%3Fid%3D1037+&cd=3&hl=en&ct=clnk&gl=us.

regardless of the fuel they used. At the time, there was controversy over the ability of diesel cars to meet the new standards.

How Can NO_x Emissions from Diesel-fueled Engines Be Controlled?

It is theoretically possible to run a diesel engine with near-zero emissions of both NO_x and PM, but in practice cost-effective reductions are achieved through a combination of efficient combustion processes and tailpipe emissions controls. The specific processes depend on the engine design, and involve lubrication, fuel delivery and injection systems, turbochargers, and various "aftertreatment" technologies.

One potential NO_x control technology is selective catalytic reduction (SCR), which adds urea and water to the exhaust to break down NO_x into nitrogen and carbon dioxide. Applying this solution on diesel vehicles sold in the United States requires additional equipment, including a urea tank, pump, and delivery system. Other parts of the vehicle would have to be designed to leave room for the SCR components.

Another potential control technology is a nitrogen oxide trap. Such a trap, or "adsorber," chemically binds nitrogen oxides during lean engine operation. After the adsorber is saturated to capacity, the system is regenerated with an injection of diesel fuel, and the released NO_x is catalytically reduced to nitrogen. This solution requires the use of additional fuel that is not dedicated to powering the engine, and thus, the vehicle's performance and fuel economy are compromised. It is alleged that VW used the defeat devices to circumvent adsorber technology in the noncompliant vehicles under investigation.

How Does EPA Test for Emissions Compliance?

To receive a "certificate of conformity" (COC) and sell vehicles in the United States, automakers must certify that their vehicles will meet emissions standards. In addition to initial testing and certification, automakers must test vehicles after production through the In-Use Verification Program (IUVP). According to EPA, if the IUVP reveals problems, "EPA would work with the manufacturer to fix them, either through voluntary manufacturer action or, if necessary, through an ordered emissions recall."[25]

In addition to the manufacturer-controlled IUVP, EPA also conducts limited "surveillance testing" at its laboratory in Ann Arbor, MI. EPA selects vehicles for such testing from IUVP data, EPA certification data, consumer complaints, and random selection. Each year EPA tests a few dozen vehicles.

In the wake of the VW allegations, EPA issued guidance to manufacturers on September 25, 2015, that it may require additional testing to investigate potential defeat devices.[26]

Why Might Have VW Installed a Defeat Device?

VW has not stated why the defeat devices were installed. Experts in automotive technology have said that disengaging the pollution controls on a diesel-fueled car can yield better performance,

[25] See EPA, "2008 Progress Report: Vehicle and Engine Compliance Activities," EPA-420-R-10-022, August 2010, http://www3.epa.gov/otaq/about/420r10022.pdf#page=31.

[26] EPA, "EPA Update on Recent Volkswagen Announcement," press release, September 18, 2015, http://yosemite.epa.gov/opa/admpress.nsf/6424ac1caa800aab85257359003f5337/6579a74e2ed0039185257ecb004f34cf!OpenDocument.

including increased torque and acceleration.[27] Further, several types of emissions control technologies require fuel to run; thus, disengaging them would return better fuel economy for the vehicle. In the case of VW, such modifications may have been intended to allow vehicles designed for the European Union market to meet more stringent U.S. NO_x regulations, avoiding additional investment for the comparatively small U.S. diesel vehicle market.

Consumer Reports concluded that VW may have used the defeat devices to increase fuel economy and vehicle performance. It tested MY2011 and MY2015 VW TDI diesel vehicles with and without the defeat device engaged and found a "noticeable decline in fuel economy for both models" when the defeat device was not engaged.[28]

The Investigation and Potential Outcomes

What Violations of the CAA Were Alleged in DOJ's Civil Complaint?

On January 4, 2016, DOJ filed a civil complaint against VW in the U.S. District Court for the Eastern District of Michigan[29] based on the allegations regarding installation of defeat devices in 2.0L diesel vehicles, as described in this report.[30] The complaint made four claims for relief:

- that Volkswagen sold, offered for sale, introduced into commerce, delivered for introduction into commerce, or imported vehicles that did not conform in all material respects with the specifications in the COCs purported to cover them, in violation of Section 203(a)(1) of the CAA;[31]
- that Volkswagen manufactured, sold, offered for sale, or installed parts or components in certain vehicles intended for use with motor vehicles where a principal effect of the part or component is to bypass, defeat, or render inoperative a device or element of design installed in compliance with CAA regulations, in violation of Section 203(a)(3)(B) of the CAA;[32]
- that certain auxiliary emission control devices installed by Volkswagen had the effect of removing or rendering inoperative devices or elements of the emissions control system installed in new vehicles in compliance with CAA regulations, in violation of Section 203(a)(3)(A) of the CAA; and
- that Volkswagen failed to disclose the existence of the auxiliary emission control devices in the COC applications for test groups for new vehicles, in violation of the reporting requirements found in Section 203(a)(2) of the CAA.[33]

[27] See Coral Davenport and Jack Ewing, "VW Is Said to Cheat on Diesel Emissions; U.S. to Order Big Recall," *New York Times*, September 18, 2015.

[28] Jeff Bartlett, "Guide to the Volkswagen Emissions Recall," *Consumer Reports*, January 4, 2016, http://www.consumerreports.org/cro/cars/guide-to-the-volkswagen-dieselgate-emissions-recall-.

[29] The matter was subsequently transferred to ongoing multi-district litigation before the Northern District of California, as discussed below.

[30] U.S. v. Volkswagen AG *et al.*, 2:16-cv-10006 (Complaint), January 4, 2016. The complaint is available at http://www.justice.gov/opa/file/809826/download.

[31] Complaint, ¶¶ 103-105, citing 42 U.S.C. §7522(a)(1).

[32] Complaint, ¶¶ 109-111, citing 42 U.S.C. §7522(a)(3)(B).

[33] Complaint, ¶¶ 123-129, citing 42 U.S.C. §7522(a)(2).

What Legal Consequences Might Have VW Faced for the Violations Alleged in the January 2016 DOJ Civil Complaint of the CAA?

Part A of Title II of the CAA, which deals with emissions standards for moving sources, does not provide for criminal penalties. It is possible, however, that VW or its officials could face criminal charges based on other statutes.[34] For example, DOJ could pursue charges under federal mail fraud or wire fraud prohibitions if VW has used either medium to convey false information in service of a "scheme or artifice to defraud."[35]

In addition, CAA violations like those described in the January 2016 Complaint can trigger civil penalties. Section 205 of the CAA sets forth civil penalties for these violations. The January 4, 2016, complaint provided further details regarding the potential penalties applicable to Volkswagen:

- For violations of the COC requirements found in Section 203(a)(1) of the CAA, the complaint stated that failure to comply with the requirements is a separate offense for each motor vehicle, and that pursuant to Section 205(a) of the CAA, VW could be liable for civil penalties of up to $32,500 per vehicle for each violation occurring before January 13, 2009, and for civil penalties of up to $37,500 for each violation occurring on or after January 13, 2009.[36]
- For violations of the prohibition on installation of a "defeat device" found in Section 203(a)(3)(B) of the CAA, the complaint again stated that failure to comply with the requirements is a separate offense for each motor vehicle, and that pursuant to Section 205(a) of the CAA, VW could be liable for civil penalties of up to $2,750 per part or component installed vehicles prior to January 13, 2009, and for civil penalties of up to $3,750 per part or component installed on or after January 13, 2009.[37]
- For violations of the prohibition on tampering found in Section 203(a)(3)(A) of the CAA, the complaint stated that each vehicle equipped with an auxiliary emission control device that removed or rendered inoperative devices or elements of the emissions control system installed in new vehicles constitutes a separate violation, and that pursuant to Section 205(a) of the CAA, VW could be liable for civil penalties of up to $32,500 per vehicle for each violation occurring before January 13, 2009, and for civil penalties of up to $37,500 for each violation occurring on or after January 13, 2009.[38]
- For violations of the reporting requirements of Section 203(a)(2) of the CAA, the complaint stated that each failure to provide reports or information constitutes a separate violation, and that pursuant to Section 205(a) of the CAA, VW could be liable for civil penalties of up to $32,500 per day of violation occurring before

[34] Reports emerged in August 2016 suggesting that DOJ is investigating the possibility of criminal liability for Volkswagen for the actions described here, although the reports did not mention a specific criminal charge. See, for example, Mike Spector and Aruna Viswanatha, "U.S. Said to Uncover Evidence of Criminal Acts in VW Probe," *Wall Street Journal*, August 15, 2016.

[35] 18 U.S.C. §§1341, 1343.

[36] Complaint ¶¶ 106-107, citing 42 U.S.C. §7524(a). The shift in the penalty cap on January 13, 2009, is a product of a regulatory adjustment to civil monetary penalties by EPA on that date pursuant to the Federal Civil Penalties Act of 1990 (28 U.S.C. §2461 note) and the Debt Collection Improvement Act of 1996 (31 U.S.C. §3701 note).

[37] Complaint, ¶¶ 112-113, citing 42 U.S.C. §7524(a).

[38] Complaint, ¶¶ 119-121, citing 42 U.S.C. §7524(a).

January 13, 2009 and up to $37,500 per day of violation occurring on or after January 13, 2009.[39]

- VW also faces the possibility of injunctive relief for each of the alleged violations pursuant to Section 204(a) of the CAA.[40] This allows the court to take action to restrain VW from continued violations of the listed provisions.

It should be noted that the potential penalties outlined above are not generally imposed, as automakers charged with such violations generally negotiate a lower penalty with EPA to settle the case. For example, DOJ sued Toyota for $58 billion in environmental violations more than a decade ago, but Toyota settled with the government, resulting in, among other things, a $34 million penalty.[41] This appears to have been the avenue chosen by VW and DOJ in this instance, as discussed below.

In addition, it should be noted that Section 205 of the Clean Air Act specifically requires courts to consider a violator's ability to pay a penalty and remain in business when assessing a civil penalty. Section 205 states the following:

> In determining the amount of any civil penalty to be assessed under this subsection, the court shall take into account the gravity of the violation, the economic benefit or savings (if any) resulting from the violation, the size of the violator's business, the violator's history of compliance with this title, action taken to remedy the violation, the effect of the penalty on the violator's ability to continue in business, and such other matters as justice may require.[42]

For more information on enforcement actions and settlements for noncompliance with federal pollution control requirements, see CRS Report RL34384, *Federal Pollution Control Laws: How Are They Enforced?*.

What Are VW's Obligations Under the Proposed DOJ Civil Settlement?

On January 15, 2016, DOJ's litigation, which had been initiated in the Eastern District of Michigan, was transferred to the U.S. District Court for the Northern District of California in order to consolidate it with an ongoing litigation in which a number of private parties have filed claims based on VW's alleged wrongdoing.[43] Subsequently, VW reached a series of settlements that may resolve many of its liability issues related to the installation of defeat devices in 2.0L diesel vehicles.[44] In addition to filed settlements related to alleged violations of Federal Trade Commission (FTC) regulations[45] and private liability claims,[46] a Proposed Partial Consent Decree filed on June 28, 2016, appears to resolve VW's potential liability for the violations of CAA

[39] Complaint, ¶¶ 129-131, citing 42 U.S.C. §7524(a).

[40] Complaint, ¶¶ 107, 113, 121 and 131, citing 42 U.S.C. §7523(a).

[41] Julia Edwards and Georgina Prodhan, "Volkswagen faces billions in fines as U.S. sues for environmental violations," January 6, 2016 and U.S. v Toyota Motor Corp et al., Civ. No. 99-1888, Consent Decree (D.C. Cir 2003); http://www.epa.gov/sites/production/files/documents/toyotacd.pdf.

[42] 42 U.S.C. §7524(b).

[43] *U.S. v. Volkswagen AG*, 2:16-cv-10006, Notice of Transfer. (January 15, 2016).

[44] Note that Volkswagen also appears to have reached settlement on claims brought by the Federal Trade Commission (FTC) and private parties.

[45] *In re: Volkswagen "Clean Diesel" Marketing, Sales Practices and Products Liability Litigation*; MDL No. 2672-CRB, [Proposed] Partial Stipulated Order for Permanent Injunction and Monetary Judgment (June 28, 2016).

[46] *In re: Volkswagen "Clean Diesel" Marketing, Sales Practices and Products Liability Litigation*; MDL No. 2672-CRB, Consumer Class Action Settlement Agreement and Release (Amended) (July 26, 2016).

requirements described above.[47] The consent decree also appears to resolve VW's potential liability for violations of the California Health and Safety Code and the California Code of Regulations.[48]

According to the Notice of Lodging of Proposed Partial Consent Decree issued by DOJ on July 6, 2016,[49] "[t]he three settlements resolve separate claims but offer coordinated relief."[50] This coordinated relief provided for in the three settlements includes the following:

- VW must offer all eligible owners and lessees of eligible vehicles the option to have VW buy back their cars or to terminate their leases at no cost. VW may submit for EPA and CARB review and approval a proposal for modifying these 2.0 liter vehicles to reduce emissions. If EPA and CARB approve an emissions modification for any category of the 2.0 liter vehicles, VW may offer all eligible owners and lessees the additional option of receiving an emissions modification in lieu of a buyback.
- VW must fund a trust over three years in the total amount of $2.7 billion, which states, Puerto Rico, the District of Columbia, and Indian tribes can use to perform specified NO_x mitigation projects.
- VW must achieve a recall rate (through the buyback, lease termination, scrapped vehicles, and the emissions modification option, if approved) of 85% by June 30, 2019. If it fails to do so, VW must augment the mitigation trust fund discussed below by $85 million for each 1% that it falls short of the 85% rate. VW must also achieve a separate 85% recall rate for vehicles in California, and must pay $13.5 million to the mitigation trust (solely for mitigation projects in California) for each 1% that it falls short of this target.
- In connection with the buyback, VW must pay eligible owners no less than the cost of the retail purchase of a comparable replacement vehicle of similar value, condition, and mileage as of September 17, 2015, the day before the existence of the defeat devices was made known to the public.[51] The Decree acknowledges that VW may satisfy this obligation through offering the payments required by the FTC Order and the Class Action Settlement, which are at least equal to the retail replacement value. The buyback/lease termination program under the Decree remains open for two years after the Decree is entered by the court. (See Decree Section IV.A and Appendix A.) If EPA and CARB approve an emissions modification, VW must offer it to consumers indefinitely.

[47] *In re: Volkswagen "Clean Diesel" Marketing, Sales Practices and Products Liability Litigation*; MDL No. 2672-CRB, Partial Consent Decree (June 28, 2016).

[48] The California Air Resources Board (CARB), which collaborated with EPA on the investigation of VW, issued a Notice of Violation (CANOV) to VW on January 12, 2016.[48] In the notice, CARB alleged 13 different violations of the California Health and Safety Code or the California Code of Regulations triggered by the sale or offering for sale of approximately 75,688 vehicles in the state of California. The alleged violations range from failure to disclose all auxiliary emission control devices in its applications for CARB certification to violation of emission warranty requirements. The California Notice of Violation can be viewed at http://arb.ca.gov/msprog/vw_info/nov_vw.pdf.

[49] Notice of Lodging of Proposed Partial Consent Decree Under the Clean Air Act, 88 Fed. Reg. 44,501 (July 6, 2016).

[50] *Id.*

[51] This is the "retail replacement value."

- VW must invest $2 billion over a 10-year period to support the increased use of zero emission vehicle (ZEV) technology[52] in the United States, including the development and maintenance of ZEV charging stations and infrastructure.[53]

Note that the proposed consent decree, the FTC settlement, or the private settlement would not absolve VW of potential civil penalties claimed by the federal government in the January 2016 Complaint,[54] or of any potential criminal charges related to this matter.

What Is the Next Step in the Federal Proceedings?

The publication of notice of the Proposed Consent Decree triggered a 30-day public comment period, which concluded on August 6, 2016. If the Proposed Consent Decree is approved and adopted by the U.S. District Court for the Northern District of California following review of the public comments, it will become binding on the parties, and DOJ's claims for injunctive relief will be dismissed. It is not clear how the outstanding DOJ claims for civil penalties will be addressed going forward.

Have Similar Violations Happened Before?

Since the 1970s, EPA has repeatedly found manufacturers using defeat devices in violation of the CAA. When it determines that defeat devices have been installed, EPA begins enforcement proceedings. In response, automakers often voluntarily recall the vehicles and/or settle with EPA and DOJ. For example, in 1998 Honda and Ford agreed to pay $267 million and $7.8 million, respectively, for fines and pollution mitigation. Other cases where EPA has accused manufacturers of installing defeat devices include automakers VW (1973), Chrysler (1973), and General Motors (1995); heavy-duty engine manufacturers Caterpillar, Cummins, Detroit Diesel, Mack, Navistar, Renault and Volvo (1998); parts manufacturers Casper's Electronics (2013); Edge Products (2013); and Harley-Davidson (2016). For a selected list of cases involving defeat devices, see **Table 2**.

Table 2. Defeat Device Cases Under Title II of the Clean Air Act

Company	Year	Civil Penalties	Additional Relief	Affected Vehicles/Equipment	Link
Harley-Davidson	2016	$12 million	Mandatory recall/ repurchase program; destruction of recalled devices; $3 million for cleaner-burning wood stoves to mitigate air pollution	340,000 "super tuner" aftermarket defeat devices added to motorcycles, and 12,000 MY2006-MY2008 motorcycles not covered by an EPA certificate of conformity	https://www.epa.gov/enforcement/harley-davidson-clean-air-act-settlement

[52] ZEV technology measures pollution at a vehicle's tailpipe; battery electric vehicles, plug-in hybrid electric vehicles, and fuel cell vehicles are examples of ZEVs.

[53] Notice of Lodging of Proposed Partial Consent Decree Under the Clean Air Act, 88 Fed. Reg. 44,501 (July 6, 2016).

[54] *Id.*

Company	Year	Civil Penalties	Additional Relief	Affected Vehicles/Equipment	Link
Volkswagen	2015	In process		584,000 MY2009-MY2015 diesel cars	http://www3.epa.gov/otaq/cert/violations.htm
Casper's Electronics	2013	$80,000	Mandatory recall/ repurchase program; destruction of recalled devices	44,000 aftermarket "oxygen sensor simulators"	http://www2.epa.gov/enforcement/caspers-electronics-inc-clean-air-act
Edge Products LLC	2013	$500,000	Mandatory repurchase program; $157,600 in rebates to upgrade older wood-burning stoves	9,000 aftermarket electronic devices sold from 2009 to 2011 that allowed for the removal of emissions equipment	http://www2.epa.gov/enforcement/edge-products-llc-settlement
Caterpillar, Inc.	1998	$25 million	$35 million for environmental projects[a]	320,000 heavy-duty diesel engines produced from 1988 to 1998	http://www2.epa.gov/enforcement/caterpillar-inc-diesel-engines-settlement
Cummins Engine Company	1998	$25 million	$35 million for environmental projects[a]	400,000 heavy-duty diesel engines produced from 1991 to 1998	http://www2.epa.gov/enforcement/cummins-engine-company-diesel-engine-clean-air-act-settlement
Detroit Diesel Corp.	1998	$12.5 million	$12 million for environmental projects[a]	430,000 heavy-duty diesel engines produced from 1988 to 1998	http://www2.epa.gov/sites/production/files/documents/detroit-cd.pdf
Mack Trucks, Inc. and Renault Vehicules Industriels, s.a.	1998	$13 million	$18 million for environmental projects[a]	90,000 heavy-duty diesel engines produced from 1990 to 1998	http://www2.epa.gov/enforcement/mack-trucks-diesel-engine-settlement
Navistar International	1998	$2.9 million	No specific individual requirement[a]	40,000 heavy-duty diesel engines produced from 1994 to 1998	http://www2.epa.gov/enforcement/navistar-international-transportation-corporation-diesel-engines-settlement
Volvo Truck Corp.	1998	$5 million	$9 million for environmental projects	10,000 heavy duty diesel engines produced from 1994 to 1998	http://www2.epa.gov/enforcement/volvo-truck-corporation-diesel-engines-settlement
Ford Motor Company	1998	$2.5 million	$1.3 million to modify affected vehicles; plus $4.0 million to purchase nitrogen oxide credits and to support environmental projects	60,000 MY1997 vans	http://www2.epa.gov/sites/production/files/2014-06/documents/defeat.pdf http://www2.epa.gov/enforcement/ford-motor-company-clean-air-act-settlement

Company	Year	Civil Penalties	Additional Relief	Affected Vehicles/Equipment	Link
American Honda Motor Co.	1998	$12.6 million	$250 million to extend emissions warranties and provide maintenance; plus $4.5 million in other environmental projects	1.6 million MY1995-MY1997 passenger vehicles	http://www2.epa.gov/enforcement/american-honda-motor-company-clean-air-act-settlement
General Motors Corp.	1995	$11 million	$25 million recall and retrofit; plus $9 million in other actions (may include older vehicle buyback or purchasing new school buses)	500,000 MY1991-MY1995 passenger vehicles	http://echo.epa.gov/enforcement-case-report?id=HQ-1996-0001 http://www.justice.gov/archive/opa/pr/Pre_96/November95/596.txt.html
Volkswagen	1974	$120,000	None	25,000 MY1973 passenger vehicles	http://www.autosafety.org/sites/default/files/imce_staff_uploads/VW%20Defeat%20Device%20$120,00%20fine%203-12-74%20Pr.pdf
Chrysler, Ford, General Motors, and Toyota	1973	None	Remove ambient temperature sensors from new vehicles		

Source: Congressional Research Service, with data from the U.S. Environmental Protection Agency and various news sources (see hyperlinks included in the table).

Notes: MY refers to "model year." Additional remediation/injunctive relief may include actions not directly involving the affected vehicles. For example, other potential NO_x emissions reductions (e.g., providing low-emission buses for municipal fleets could qualify).

a. Plus a share of $850 million combined investment from heavy-duty engine manufacturers involved in the settlement. These investments were to cut emissions from new engines 15 months in advance of new emissions standards.

Congressional Response

What Is the Role of Congress?

Congress' initial role was to establish the anti-defeat device provisions in the 1970 amendments to the CAA. On October 8, 2015, representatives of VW and EPA testified on the VW anti-defeat devices before the House Energy and Commerce Committee's Subcommittee on Oversight and Investigations.[55]

[55] U.S. Congress, House Committee on Energy and Commerce, Subcommittee on Oversight and Investigations, *Volkswagen's Emissions Cheating Allegations: Initial Questions*, 114th Cong., 1st sess., October 8, 2015, (continued...)

Given the extensive reporting about and high visibility of VW's use of defeat devices, Congress may wish to conduct further oversight. Potential issues include whether EPA has sufficient resources to monitor vehicle emissions, whether the current penalty structure is sufficient, why EPA failed to detect VW's defeat device when there have been similar cases in the past, and whether VW's response to the emissions problem and efforts to provide restitution to U.S. customers have been adequate. Congress may also look to provide more oversight of EPA rulemaking for motor vehicle emissions standards.

The problems with VW's diesel emissions controls also are relevant to the proposed Transatlantic Trade and Investment Partnership (TTIP), now under negotiation between the United States and the European Union. Among many other topics, the negotiators are discussing harmonization of U.S. and EU vehicle regulations to make it simpler to sell U.S.-made vehicles in the EU and vice versa. Harmonization of environmental regulations and testing procedures are among the issues under discussion.[56]

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http://energycommerce.house.gov/hearing/volkswagens-emissions-cheating-allegations-initial-questions.

[56] For an analysis of the U.S. and EU vehicle regulatory systems, see CRS Report R43399, *U.S. and EU Motor Vehicle Standards: Issues for Transatlantic Trade Negotiations*.