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Too Good to Be True? Volkswagen, Audi, and the Future of Diesel

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No-no-no-no-no-no, listen to me…diesel in Latin means 'dirty.'

In its memorable "old wives' tales" commercials for its "clean diesel" cars, Volkswagen humorously sought to dispel outdated beliefs that diesel cars were stinky, sluggish, and dirty. Offering a fun yet green alternative to dull hybrids, the company promised the best of both worlds: sporty, driver-focused vehicles, with real-world highway fuel economy upwards of 50 mpg and low emissions. Notwithstanding brilliant advertising, were the old wives in the commercials actually correct? As with most things in the legal, regulatory, and engineering worlds, the answer is complicated. Diesel can still be a comparatively clean mobility option, but Volkswagen did the technology no favors with its subterfuge.

On Sept. 18, the U.S. Environmental Protection Agency (EPA) issued a Clean Air Act (CAA) notice of violation to Volkswagen and its subsidiary Audi, alleging that the companies intentionally installed software-based "defeat devices" that allowed cars to emit nitrogen oxide (NOx) 10 to 40 times over the legal limit in real-world driving. Between 2009 and 2015, Volkswagen and its subsidiaries Audi, Skoda, and Seat sold 11 million diesel vehicles with the cheating software, with nearly half a million in the United States. The software "precisely track[ed] the parameters of the federal test procedure used for emission testing" and made the emissions control systems fully active when being tested. In actual driving, however, the software reduced the effectiveness of the pollution controls, illegally trading increased NOx emissions for better mileage and acceleration.[1]

Legal Framework

The Clean Air Act sets allowable emission levels for various pollutants emitted by motor vehicles, including NOx, gases that react in the atmosphere to produce ozone (smog), which is linked to chest pain, congestion, emphysema, asthma, and other health problems.[2]

Section 203 of the act sets the compliance standards for motor vehicle manufacturers, and 40 C.F.R. Part 86 sets the emission standards and test procedures with which the manufacturers must comply. Before vehicles may be imported into and sold in the United States, the EPA must issue a certificate of conformity (COC) for each model year of the vehicle.[3] Manufacturers must submit a COC application to the EPA containing:

A list of all auxiliary emission control devices (AECD) installed on any applicable vehicles, including a justification for each AECD, the parameters they sense and control, a detailed justification of each AECD that results in a reduction in effectiveness of the emission control system, and a rationale for why it is not a defeat device.[4]

An AECD is "any element of design which senses temperature, vehicle speed, engine RPM, transmission gear, manifold vacuum or any other parameter for the purpose of activating, modulating, delaying, or deactivating the operation of any part of the emission control system."[5] A "defeat device" is "an AECD that reduces the effectiveness of the emission control system under conditions which may reasonably be expected

to be encountered in normal vehicle operation and use." In other words, a defeat device is something in a vehicle designed to cheat the Clean Air Act. Although AECDs are permitted if their use is justified, defeat devices are prohibited and no vehicle equipped with a defeat device may obtain a COC.[6]

Only the vehicle specifications listed on the application for a COC are approved by the EPA for import and sale. Any vehicles that are not "in all material respects as described in the manufacturer's applications" are not covered by the COC, even if they meet emissions standards. Furthermore, COCs are conditional upon continued compliance with the EPA's regulations on emission levels; specifically, failure to comply with the NOx emission requirements "will be considered to be a failure to satisfy the terms and conditions upon which the certificate(s) was (were) issued and the vehicles sold in violation of the fleet average NOx standard will not be covered by the certificate(s)."[7]

Under Section 7524(a) of the Clean Air Act, there are separate penalties for violating Sections 7522(a)(1) and 7522(a)(3)(b). Any manufacturer that violates Section 7522(a)(1) by distributing, offering for sale, introducing, or importing into U.S. commerce a vehicle that is not covered by a COC (or causes any of the foregoing) is subject to a penalty of up to $37,500 for each violation. Additionally, any person who violates Section 7522(a)(3)(b) by manufacturing, offering for sale, or installing any part or component into a vehicle or engine with the intention "to bypass, defeat, or render inoperative any device or element of design installed on or in a motor vehicle or motor vehicle engine in compliance with regulations" (or causes any of the foregoing) is subject to a penalty of up to $3,750 for each violation.[8]

Further, under Section 207 of the CAA, the manufacturer of any motor vehicle or engine manufactured after Dec. 31, 1970, must warrant to each purchaser (including subsequent purchasers) that the car or engine "was designed, built, and equipped so as to conform at the time of sale with applicable regulations" under the CAA.[9] If a "substantial number" of a model are found to be non-compliant, then the EPA can require the manufacturer to issue a recall at no cost to consumers. The manufacturer is also responsible for dealers' costs.[10]

Volkswagen's Violations

From at least 2009 to 2015, Volkswagen and its subsidiaries installed software in several of their diesel car models to defeat emissions tests. The software sensed testing conditions, and under those conditions it would run the cars' emission control systems on a special "dyno calibration" to produce compliant emissions while on the dynamometer used for emissions testing. According to reports, the software sensed whether two or four wheels were spinning, whether the steering wheel was being moved, and other factors characteristic of an emissions test. When the cars were operating under normal driving conditions, the software would run the emission control systems on a "road calibration" that reduced the systems' effectiveness while increasing performance. During actual driving, emissions were between 10 and 40 times higher than expected.[11]

According to the EPA, Volkswagen's software is "an AECD that reduces the effectiveness of the emission control system under conditions which may reasonably be expected to be encountered in normal vehicle operation" and the AECD was not listed and its use justified in Volkswagen's COC applications. Therefore, the software is an illegal defeat device, and the COCs are not valid as to any vehicles that have the illegal software installed. Federal courts have the power under Section 204 of the CAA to enjoin Volkswagen from selling non-conforming models. However, Volkswagen has admitted the allegations,[12] and the company has voluntarily halted sales in the United States of its 2015 and 2016 "clean diesel" models, and some foreign countries have prohibited their sale. Volkswagen has also scrubbed its website and other marketing materials of references to clean diesel.

Volkswagen's actions in distributing, selling, introducing, or delivering approximately 482,000 vehicles into U.S. commerce in violation of CAA §203(a)(1) could result in penalties of over $18 billion, with an additional approximately $1.8 billion for violation of CAA §203(a)(3)(b).[13] Volkswagen also faces a Department of Justice investigation into possible criminal charges, including environmental violations as well as charges of falsifying EPA applications, defrauding the government and consumers, and mail and wire fraud.

At least 30 states have joined a coalition to investigate possible violations of state environmental and consumer fraud laws.[14] Some, including New York, have already served subpoenas on Volkswagen. Additionally, in the weeks after the EPA's announcement, there have been hundreds of consumer class action lawsuits filed against Volkswagen from across the United States, as well as the threat of civil lawsuits in other countries around the world.[15]

Furthermore, the EPA has the power under Section 207 of the CAA to require Volkswagen and Audi to recall the cars and fix the issue at no cost to owners or dealers. The EPA has confirmed that it will do so after it has worked with Volkswagen to develop a plan, which might take up to a year.[16] Volkswagen has already announced a recall of all 11 million cars, including the approximately 482,000 sold in the United States. Volkswagen's new CEO, Matthias Mueller, said that the company hopes to begin the recall in Europe by January and complete it by the end of 2016, although in the United States any recall will first have to be approved by the EPA.[17]

Policies and Technologies

Many laws and policies drive which technologies are adopted in our automobiles, some of which conflict. Here, Volkswagen gambled on a diesel engine that got extraordinary gas mileage and low greenhouse gas (GHG) emissions, but also bet on emission control technology that was unable to reduce NOx emissions sufficiently without giving up power and gas mileage.

Reducing NOx, GHG, and fuel use are all important goals. However, it is difficult to reduce fuel use and GHG emissions while also reducing NOx. Due to the "lean" burn of diesel engines (high air-to-fuel ratio), traditional catalytic converters are not effective at reducing NOx. While diesel vehicles burn less fuel and travel more miles per gallon than gasoline vehicles, the more efficiently that diesel engines burn fuel, paradoxically, the more NOx is produced. Thus, manufacturers are faced with a difficult technical problem of keeping efficiency high while meeting NOx standards. This problem will only get more difficult as fuel economy averages are required to increase, beginning with model year 2017.[18] Today, there are two principal NOx control technologies used in motor vehicles, selective catalytic reduction (SCR) and lean NOx trap (LNT).

SCR treats the exhaust with a spray of a urea solution (commonly known as diesel exhaust fluid or AdBlue), which, in a chemical reaction is converted to ammonia and reduces the NOx to mainly nitrogen and water. SCR, which has been adopted by other diesel car manufacturers such as BMW and Mercedes, and on larger and newer VW cars, has the advantage of treating the exhaust rather than affecting combustion so that its use does not significantly affect performance and fuel efficiency. Its drawbacks are that the urea tank takes up space and the tank needs to be refilled periodically. For non-conforming cars with SCR, the problem can likely be fixed relatively easily by reprogramming how the car doses urea to the exhaust, assuming that the equipment is sized properly.

The other principal technology, and the one employed by most of the offending VW cars, is a "lean NOx trap" which captures NOx on a catalyst. The catalyst can only store so much NOx before it needs to be regenerated every minute or so, which is done by burning the NOx off, requiring changes to combustion and using more fuel. Clearing the NOx trap results in less power and worse mileage.[19] LNTs, while not as effective as SCR, were cheaper and smaller, making them desirable in small cars, such as VW's Jetta and Golf and Audi's A3. Unfortunately, Volkswagen's solution, which it had sunk much time and money into, apparently did not work as advertised in actual driving. In contrast to SCR, the fix for cars with LNTs will likely either require hardware changes or reduced performance and gas mileage.

Mueller said that reprogramming can probably be done for most cars, but in some cases new injector systems, larger catalytic converters, or even vehicle replacement will be necessary. He said that Volkswagen is "facing not just three solutions but thousands" due to different technologies used in each model and different regulatory standards in each country.[20]

While intentional subterfuge on this scale may seem unprecedented, this is not the first time that vehicle manufacturers, including Volkswagen, have been busted for gaming the system. In 1974, the EPA ordered a recall of 826,000 Chryslers with a defeat device that activated emission

control systems within the temperature range experienced during testing.[21] The same year, Volkswagen became the first automaker ever fined under the Clean Air Act ($120,000) for use of the same temperature-sensing devices.[22] Other manufacturers (GM, Honda, and Ford) have reached broader settlement agreements comprising civil penalties, recall costs, and funds for environmental research.[23]

In 1998, EPA brought eerily similar enforcement actions against several heavy-duty diesel engine manufacturers "alleging that they had been using 'defeat devices' to meet EPA standards for NOx emissions. The devices enabled the engines to meet EPA emissions standards in laboratory testing even though the engines produced NOx emissions far above the applicable limit in ordinary use."[24] The manufacturers settled with EPA for $1.04 billion, which included civil penalties of over $80 million collectively and required manufacturers to comply with emissions standards a year in advance for new engines, but allowed them to continue to sell the higher polluting engines with penalties, emissions trading, and emissions banking.[25]

Volkswagen's deception is particularly galling to consumers who purchased their vehicles for environmental reasons, paying a premium for impressive gas mileage and low pollution. Although there is no indication now that other manufacturers also cheated, it remains to be seen how Volkswagen's deception, and the company's response to the problem, will affect the future market for efficient diesel vehicles in the United States and worldwide.

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Endnotes

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[1]EPA, Notice of Violation to Volkswagen AG, Audi AG, and Volkswagen Group of America, at 2, Sept. 18, 2015, available at http://www3.epa.gov/otaq/cert/documents/vw-nov-caa-09-18-15.pdf (NOV).

[2]Id. at 2.

[3]40 CFR §86.1843-01.

[4]Id. at §86.1844-01(d)(11).

[5]Id. at §86.1803-01.

[6]Id. at §§86.1809-01, 10, 12.

[7]Id. at §86.1848-01(c).

[8]CAA §§203(a)(3)(b), 205(a); 40 C.F.R. §19.4.

[9]42 USC §7541(a)(1).

[10]Id. at §§7541(d) and 7541(c)(1).

[11]NOV at 4.

[12]Volkswagen's U.S. subsidiary stated, "[R]egrettably, VW did not comply with [EPA "defeat device"] regulations. We take full responsibility for our actions—and deeply regret that this happened." https://www.vwdieselinfo.com/faqs/.

[13]See NOV, at 5; 40 C.F.R. §19.4.

[14]See Danielle Ivory, "U.S. States Jumping into Investigation of VW Emissions Deception," N.Y. TIMES (Oct. 2, 2015), http://www.nytimes.com/2015/10/03/business/us-states-jumping-into-investigation-of-vw-emissions-deception.html.

[15]See Stuart Pfeifer, "Race Is on to File Suits Against VW," L.A. Times (Oct. 3, 2015), http://www.latimes.com/business/autos/la-fi-volkswagen-legal-20151003-story.html.

[16]See "Notice of Violations: Volkswagen: Frequently Asked Questions, EPA, http://www3.epa.gov/otaq/cert/violations.htm (last visited Oct. 1, 2015).

[17]See "VW to Recall Europe Diesel Starting in January; U.S. Sales to Continue for Now," Auto News (Oct. 6, 2015), http://www.autonews.com/article/20151006/OEM11/151009879/vw-to-recall-diesel-models-starting-in-january-mueller-says.

[18]2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards, 77 Fed. Reg. 62627 (Oct. 15, 2012).

[19]Tim DeChant, NovaNext, "Volkswagen's Little Engine That Couldn't," Sept. 22, 2015, http://www.pbs.org/wgbh/nova/next/tech/volkswagen-diesel-emissions.

[20]See Auto News, supra note 20.

[21]See EPA, "EPA Orders Chrysler Recall," Environmental News Summary 2 (Mar. 22, 1974), http://nepis.epa.gov/Exe/ZyPDF.cgi/9101X867.PDF?Dockey=9101X867.PDF.

[22]See EPA, "EPA Refers Investigation of Volkswagen to Justice," ENVIRONMENTAL NEWS (July 23, 1973), http://www.autosafety.org/sites/default/files/imce_staff_uploads/VW Defeat Device EPA Prosecution 7-23-73 Pr.pdf.

[23]EPA, Civil Cases and Settlements by Statute: CAA, http://cfpub.epa.gov/enforcement/cases/index.cfm?templatePage=12&ID=1.

[24]*U.S. v. Volvo Powertrain Corp.*, 758 F.3d 330, 333 (D.C. Cir. 2014).

[25]EPA, "DOJ, EPA Announce One Billion Dollar Settlement with Diesel Engine Industry for Clean Air Violations" (Oct. 22, 1998), http://yosemite.epa.gov/opa/admpress.nsf/b1ab9f485b098972852562e7004dc686/93e9e651adeed6b7852566a60069ad2e.