

Volkswagen's Dieselpgate

Part Two: VW is not a Rogue Company in Europe



Overview

The effects of catastrophe spread in an uncontrollable and unpredictable manner. For example, BP's 2010 Deepwater Horizon blowout in the Gulf of Mexico combined with Enbridge's Kalamazoo River spill in the same year lowered the public's trust in oil company safety and helped block TransCanada's Keystone II pipeline approval in 2015. Because of these events it is much more difficult to obtain approvals for new pipelines in Canada and the U.S.

Similar forces are at work after The Volkswagen Group (VW) was caught cheating U.S. emissions tests for its diesel cars in 2015. VW was hit with harsh penalties in the U.S., costing the company \$25 billion U.S. so far. But the effect of Dieselgate will have the most corporate damage in Europe where diesels have captured half the auto market.

Because of Dieselgate, Europeans are becoming aware that it is common for diesels to have vastly greater levels of NOx pollution in real life driving than in government emissions tests. A 2016 study conducted by the U.K. Ministry for Transport found that new Euro5 diesel cars emitted on average slightly more NOx pollution than 1990 Euro1 emission levels. The emission limits had shrunk 81% from 1990 to 2016, but average real-world emissions stayed the same.

European cities are choking from what had been unacknowledged diesel pollution. The regulators will be forced to impose emission levels outside of their labs, where the emissions actually occur. Real enforcement of pollution limits will crush diesel sales because action to reduce NOx emissions weakens other cherished performance measures of diesels like fuel mileage and torque. Customers will not buy diesels that meet emission regulations and that is why the manufacturers learned to optimize tests.

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VW is not a Rogue Company in Europe

VW is a Leader, not a Rogue, at Home

"We had not the right interpretation of the American law ... We didn't lie. We didn't understand the question first." VW CEO, Matthias Müller, speaking on National Public Radio, January 2016¹



One of the great puzzles about the Volkswagen Group's Dieseldiegate scandal is why this sophisticated corporation did not admit fault right away when they were caught by U.S. regulators in 2014. The playbook in this situation is to confess, stop the damage and work together with the authority for redemption. This usually leads to quick but manageable punishment.

Volkswagen (VW) passenger diesels were emitting up to 40 times permissible amount of nitrous oxides (NOx) when driven on the road. When the regulators asked for an explanation VW did not

confess or act to stop the pollution. Instead they took a series of actions that cost them dearly:

1. Initially VW denied the existence of the problem, saying the regulator's measurement system was faulty.
2. When the regulator's data could no longer be denied, VW offered to fix the emissions problem in an upcoming recall.
3. During the recall VW pretended to fix the problem and offered fake engineering reports to show the emissions improvement.
4. When the regulators tested the 'improved' vehicles and found the emissions remained the same, VW pushed for delay.
5. When the regulators discovered clear proof that the vehicles contained a 'defeat device' designed to cheat the lab emission tests, VW denied the existence of the defeat device.
6. When the regulators finally threatened to stop all sales of its upcoming model year diesel vehicles VW admitted that their diesel engines contained defeat devices designed to cheat emissions testing.
7. Throughout the 18 month period between first notification of the emissions problem and the order to stop sales, VW continued to sell passenger diesels in the U.S. that emitted up to 40 times the permitted level of NOx pollution.

It appears VW's strategy was to put up enough barriers that the regulators would tire and just go away. But the U.S. regulators, Environment Protection Agency (EPA) and California Air Resources Board (CARB), did not fold or disappear. They worked with VW in good faith, giving them every opportunity to join the cooperative regulatory stream, but VW refused. Every step VW took along the confrontational road cost them increased penalties.

¹ Smith, Geoffrey & Parloff, Roger (2016, March 15) Hoaxwagen. Fortune Magazine.

Regulatory systems depend on industry participants displaying a base level of honesty and a willingness to play within the rules—any action outside of this threatens the entire regulated structure. VW is treated as a rogue company in the U.S. largely because of what they did after they got caught. If they had followed the standard playbook and cooperated when confronted the U.S. penalties would have been a good deal less than the \$25 billion that VW must now pay out.

“They lied through their teeth,” said Alberto Ayala, deputy executive officer of the California Air Resources Board in October 2016 when discussing VW’s relationship with U.S. regulators during 2014-15².

VW Misunderstood How U.S. Regulators Operated

VW did have the wrong interpretation of the American law as their CEO, Matthias Müller stated. In Europe automobile emission laws are a means of covering up emissions, not reducing them. It appears VW thought the same was true in the U.S. This was the wrong interpretation of the situation.

Things are Different in Europe

The diesel engine commands more than 50% of the passenger vehicle market in Europe, so diesels really matter there. In contrast diesel cars are rare in the U.S.

Europe’s affection for the diesel automobile began in s in response to the oil embargoes in the 1970’s. When Middle Eastern countries restricted oil exports Europe was hit particularly hard because it had no oil or gas production. Germany, Switzerland, Norway, France, Denmark and others were forced to place limitations on driving, boating and flying to conserve fuel. The British Prime Minister urged people to heat only one room in the winter.

The fuel shortages left a real mark on Europeans. A broad consensus developed that they must never again be as dependent on imported oil and so individuals and governments placed a very strong emphasis on energy efficiency. As a first move fuel taxes were sharply increased.

The fuel taxes were generally supported as a way to strengthen Europe. Consumers quickly switched, without much complaint, to more fuel efficient vehicles. This switch caused another problem though because most of the more frugal vehicles were manufactured in Japan. European manufacturers then clamored for increased regulation to protect their markets while they switched their products to fit the new demand for fuel efficiency.

Fuel taxes were sharply increased throughout Europe to encourage fuel efficiency. This produced an opening for Japanese cars as they were much more frugal than European vehicles. The increased sales of Japanese cars then caused howls of complaint from European manufacturers about unfair competition combined with requests for increased regulation to protect jobs.

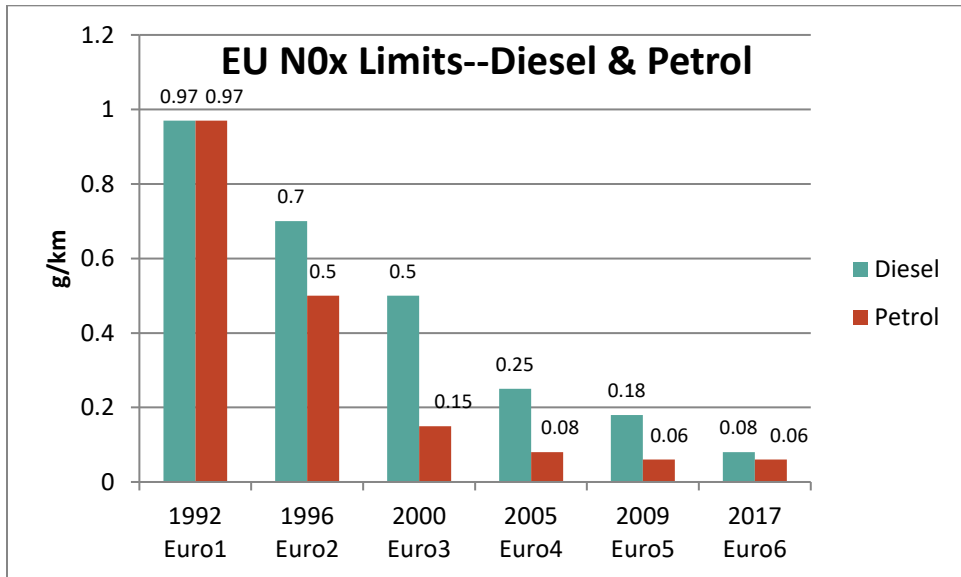
Government Support for Passenger Diesels

European governments and manufacturers identified increased use of passenger diesel cars as a way to reduce overall fuel consumption and support local manufacturers. To achieve these objectives diesel

² Ewing, Jack. (2016, November 6). Volkswagen Emissions Scandal Inquiry Widens to Top Levels. NY Times.

fuel taxes were lowered and fuel efficiency standards tightened further. Governments decided that they would have to initially live with the diesel engine's higher emission levels but that emissions could be lowered over time with effort and technical improvements.

In the early 1990's the European Commission set out schedules for emission reductions in gasoline and diesel engines. Diesel emissions were a tougher technical challenge and so diesels were allowed to lower their emissions more slowly. It was expected to take 25 years for diesels to be able to match the emission levels of gasoline engines. The lag in emission performance was balanced by the advantage diesels had in fuel economy.



Even though fuel efficiency was prioritized in Europe, the required pace of diesel emission reductions was daunting. NOx emissions were expected to shrink 81% from 1992 to 2009. In addition to this pressure, customers demanded more and more sophisticated performance from their diesel vehicles. If you could lead the diesel market in Europe you led the world in that technology.

Europe became a hotbed of innovation in passenger diesel engines. The diesel market share grew to half the automobile sales in Europe by 2011, with Spain and France hitting this level in 2000. The increase in passenger diesels meshed with Europe's commitment to reducing carbon emissions. The European support for diesels seemed to have paid off: European manufacturers built a world-leading competitive advantage in diesel engine technology; fuel efficiency in Europe improved greatly, and the new diesels passed emission tests every time the limits shrunk.

By 2007 VW had proven its mettle in the very tough market for passenger diesels in Europe. It was a leader in all segments of the diesel market with its Audi, Porsche, VW, Skoda and Seat brands. VW was sure that diesels were the best product for a world that was finally focused on fuel efficiency, and it was convinced its diesels were by far the best for mass markets.

But the VW, and other European diesels, were not ready for the rest of the world in 2007. Manufacturers had learned to control the testing for emissions, but not the emissions themselves. Emission limits had shrunk massively since 1992, but emissions had not. "The problem is, the tests

³ Source: https://www.theaa.com/motoring_advice/fuels-and-environment/euro-emissions-standards.html

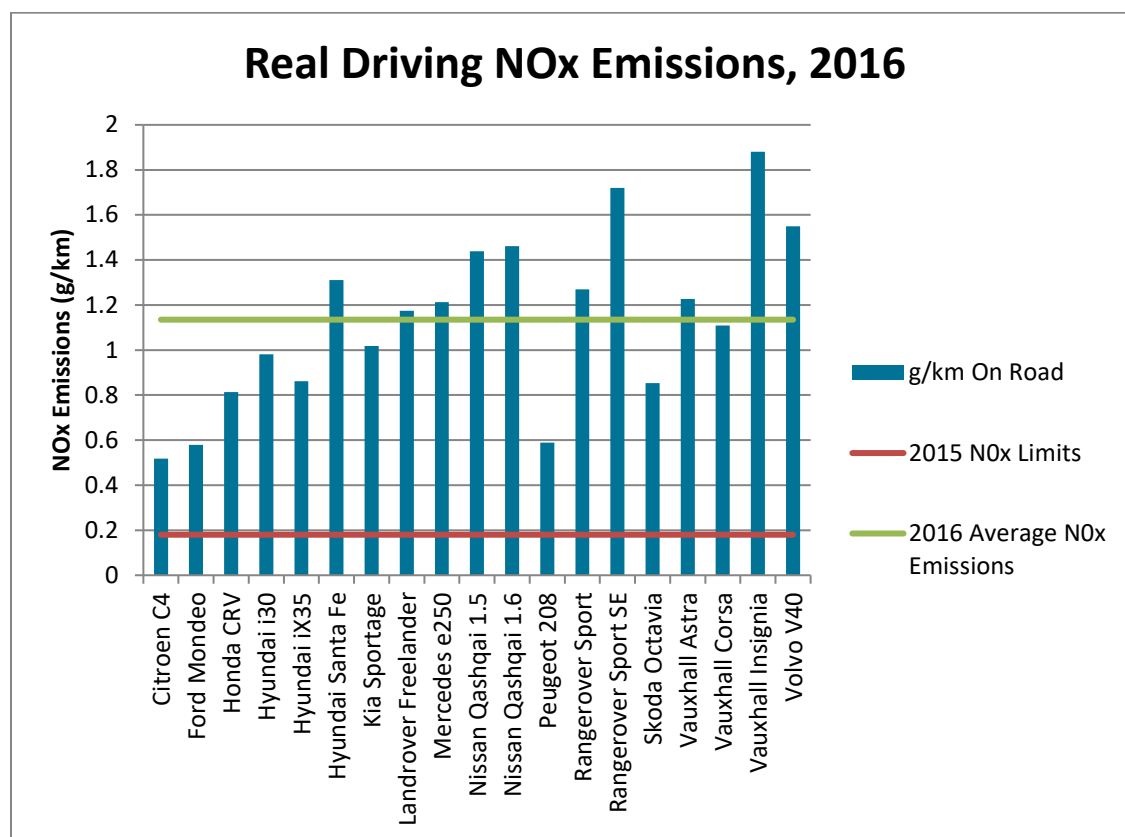
which are done in the laboratory do not correspond to the actual performance on the street and that’s absolutely what we have to fix,” said Janez Potocnik, European Commissioner of the Environment in 2013. “The actual situation is such that the [emissions] performance on the street today is basically somewhere around the level of the standards that were set in Euro 1. This was by the way, in 1992.”⁴

European regulators knew about the gap between lab and street emissions but they did not act⁵. Manufacturers had learned to ‘optimize’ emissions tests in ways that were perfectly legal and nobody paid attention to emissions outside of the lab.

The blindness to real emissions continues to this day, although Dieselgate has lifted the shroud somewhat. National regulators have now started testing the street performance of new vehicles.

For example, the British Department for Transport tested real world NOx emissions on the 37 most popular diesels in the UK in 2016. Their sample represented 50% of all diesel cars on the road in the UK from 2010–2015. Not a single model met the EU standard. “On average our measured road test NOx emissions from Euro 5 vehicles were 1135 mg/km - over six times higher than the 180 mg/km official legislative NEDC laboratory test limit⁶.” All these vehicles passed emissions testing in the lab.

Real Driving NOx Emissions—Euro 5 vehicles⁷



⁴ Quote from December 2013 press conference. (see video after the 9 minute mark).

<http://ec.europa.eu/avservices/video/player.cfm?ref=I085099>

⁵ See (2011). Analyzing on-road emissions of light-duty vehicles with Portable Emission Measurement Systems (PEMS). JRC Scientific and Technical Reports, European Commission JRC. EUR 24697 - 2011

⁶ (2016, April). Vehicle Emissions Testing Programme. Department for Transport, UK. Cm 9259.

⁷ (2016, April). Vehicle Emissions Testing Programme. Department for Transport, UK. Cm 9259.

It is a competitive necessity to ‘optimize’ emission tests in Europe, as the Ministry for Transport data shows. Their sample did not turn up a single vehicle that complied with EU emission limits on the road. Real emissions reduction costs money for equipment, increases fuel use and reduces other important vehicle characteristics such as torque and acceleration. If manufacturers are allowed to control emissions only in the lab that is what they will do—and that is what they have done in Europe since 1992.

The health of the regulatory system makes a vast difference. VW faces a ban on diesel sales, massive fines and ongoing court cases for having sold 482,000 vehicles containing defeat devices in the U.S. during the Dieselgate Era (2007-2015). In the same time period VW sold 8.5 million diesels with the same gear, emitting the same pollution per car, in Europe. VW has not received fines or penalties in Europe even though their total pollution in Europe is much, much higher than in the U.S.

A rogue company in Europe would be one that complies with diesel emission limits. None appear to do so.

Regulatory Capture is Inevitable and Dangerous

Regulatory Capture: “The tendency for regulated firms and their government regulators to develop mutually beneficial relationships that are harmful to the economy, public safety, and people’s lives more generally.”

Europe’s system for controlling emissions from automobiles is an elaborate sham. After consultation with industry experts, environmental groups, municipal and national leaders and others the European Parliament set a series of reduced emission limits for particulate matter, NO_x, CO₂ and other pollutants, starting in 1992. Manufacturers submitted their vehicles every year for detailed emissions testing in highly sophisticated labs, reports from these tests were sent to government agencies for approval, and the vehicles were approved for sale.

But the emissions did not shrink. Limits for NO_x emissions from passenger diesels had shrunk 81% in the years 1992–2015 (Euro 1 – Euro 5). The 2016 UK Ministry for Transport study cited earlier showed their large sample of Euro 5 certified cars on the road had on-street NO_x emissions averaging 16% above the 1992 standard and 600% above the 2015 Euro 5 standard⁹. Over that period the passenger diesel fleet grew to about half of all vehicle sales.

This is clearly the work of a captured regulator. It is much cheaper, apparently, for manufacturers to control emissions only in the lab. The rules are set up such that emissions in the real world are not monitored and the test ‘optimization’ innovations are all perfectly legal. Legislators, regulators and manufacturers have built a system in which all parties can announce fictional emission reductions over more than 20 years.

Once the regulator is captured all industry participants have to participate. “Compliant parties are placed in a competitive disadvantage if non-compliant companies and facilities are able to avoid

⁸ Taylor, John B. & Wolak, Frank A. (2012). "A Comparison of Government Regulation of Risk in the Financial Services and Nuclear Power Industries," Discussion Papers 11-018, Stanford Institute for Economic Policy Research.

⁹ (2016, April). Vehicle Emissions Testing Programme. Department for Transport, UK. Cm 9259.

compliance costs others bear. Unfairness can become a serious problem if not monitored and addressed.”¹⁰

We will show later in this section how far some of the most prized and respected corporations in the world twisted their ethics when faced with a captured regulator in European auto market. First though we will discuss why regulatory capture is seen as inevitable.

The Inevitability of Regulatory Capture

George Stigler, the Nobel Prize winning economist, argued in 1970 that regulators inevitably collapse under the strain of competing interests and become captured by one set of interests—those of industry. When that happens Stigler says, “Regulation is acquired by the industry and is designed and operated primarily for its benefit.”¹¹

Stigler argued that any regulated system tends to move toward capture by industry because of four factors¹²:

- The regulated industry controls the information used by the regulator.
- The regulated industry cares more about the regulations than consumers or other stakeholders.
- The best place for an experienced regulator to work after a career change is somewhere within the regulated industry.
- The regulated industry lobbies hard with the regulators bosses. Often there are trade-offs for employment, investment and other social goods. Political donations matter as well.

The European Commission denies that their emissions regulation system is captured. “We are just as shocked as everyone about the Volkswagen emissions manipulation,” said a Commission spokeswoman. “No concrete evidence on the use of defeat devices or the failure of a member state to act was every brought to the attention of the Commission.”¹³

The regulators ought not to have been shocked to find in 2015 that Volkswagen had a serious emissions problem because they had commissioned a study in 2011 that showed all passenger diesels exceeded NOx limits by 400-700%. The study was initiated to investigate why air quality in European cities was not improving as much as expected even though emission limits had been vastly lowered. The conclusions of the report were very clear.

“These results indicate that NOX emissions of light-duty diesel vehicles substantially exceed the Euro 3-5 emission limits: by a factor of 4-7 as averages over entire test routes and up to a factor of 14 for individual averaging windows. The increasing stringency of European emission limits has, thus, not resulted in an equivalent reduction of on-road NOX emissions of light-duty diesel vehicles.”¹⁴

No actions were taken to improve real world emissions in light of the 2011 report. The inaction is partly due to the design of the European regulatory system. Emission limits are set by the European

¹⁰ Metzenbaum, Shelley (2015). Environmental Compliance and Enforcement Measurement: Why, What, and How? University of Pennsylvania Law School: Penn Program on Regulation

¹¹ Stigler, George. (1971). The Theory of Economic Regulation. Bell Journal of Economics and Management Science 2 (spring): 3-21

¹² McArdle, Megan (2014). It's Normal for Regulators to Get Captured. BloombergView.

¹³ Becker, Marcus (2016, July 15). EU Commission Has Known for Years about Manipulation. Spiegel Online.

¹⁴ Weiss, Bonnel, Hummel et. al. (2011). Analysing on-road emissions of light-duty vehicles with Portable Emission Measuring Systems (PEMS). Joint Research Commission / European Commission. EUR 24697 EN.

Parliament and these are regulated by the European Commission. Testing of emissions and enforcement is the responsibility of the 28 EU member national governments. Manufacturers are allowed to choose the national regulator they will use to test emissions for each of their vehicles, and the national regulators tend to support local employers.

Consumers are not clamoring for better control of NOx. They had pushed for the elimination of particulates, as these cause cancer and produce the ugly black smoke that once was the signature of diesel engines. NOx emissions are invisible. NOx emissions produce smog but this affects the health of vulnerable people—poor, elderly, inner city dwellers who are not often purchasing new diesel automobiles.

Regulatory capture occurs because the costs and benefits of regulation fall on different parties. As Kathryn Harrison of the University of British Columbia points out, “Those constrained by regulation typically are keenly aware of what is at stake for them and motivated to defend their interests with regulators, whether on their own or via collective action. In contrast, the beneficiaries of broadly-diffused benefits tend to be ill-informed, inattentive, and unorganized.”¹⁵

The Dangers of Regulatory Capture

The chief danger posed by regulatory capture is that the vulnerable people and/or the physical environment meant to be protected by regulation are endangered. For example, in November 2015 nitrogen oxide levels in Madrid’s city centre were almost double the World Health Organization (WHO) guidelines¹⁶. The result of poor air quality in Europe is estimated to be half a million premature deaths and a quarter million hospital visits¹⁷.

Companies and individuals prefer to externalize the costs of their activities and internalize revenue and other benefits. The failed regulatory system in Europe has allowed the diesel auto manufacturers and consumers to participate in sham lab tests that give the appearance of pollution controls and then release more NOx pollution than massive transport trucks. The costs of the increased pollution are borne by the state medical system and by individuals whose health deteriorates. The benefits of NOx pollution are captured through lower costs to consumers, improved performance by the cars and increased sales by manufacturers.

The direct costs of regulatory failure are serious, but they are only part of the story. Once a regulator gets captured by the regulated industry’s needs a number of other dangerous forces are unleashed. These are:

- **Corporate ethics of good firms are badly compromised.** Adding effective gear for controlling NOx pollution from passenger diesel engines costs €200-400 and operating this equipment reduces gas mileage. Setting up systems to control emissions only in the lab costs some of our most cherished corporations their ethical foundations. Employees in these companies are justified in finding other expedient shortcuts that may compromise safety or financial performance.

¹⁵ Harrison, Kathryn (2015). Climate Change Regulation: Lessons from Regulatory Failure. University of Pennsylvania Law School: Penn Program on Regulation

¹⁶ Jones, Sam. (2016 November 1). Madrid Poised to Restrict Cars in City Centre Amid Air Pollution Fears. The Guardian.

¹⁷ (2015, September). Don’t Breathe Here. Transport and Environment Publications.

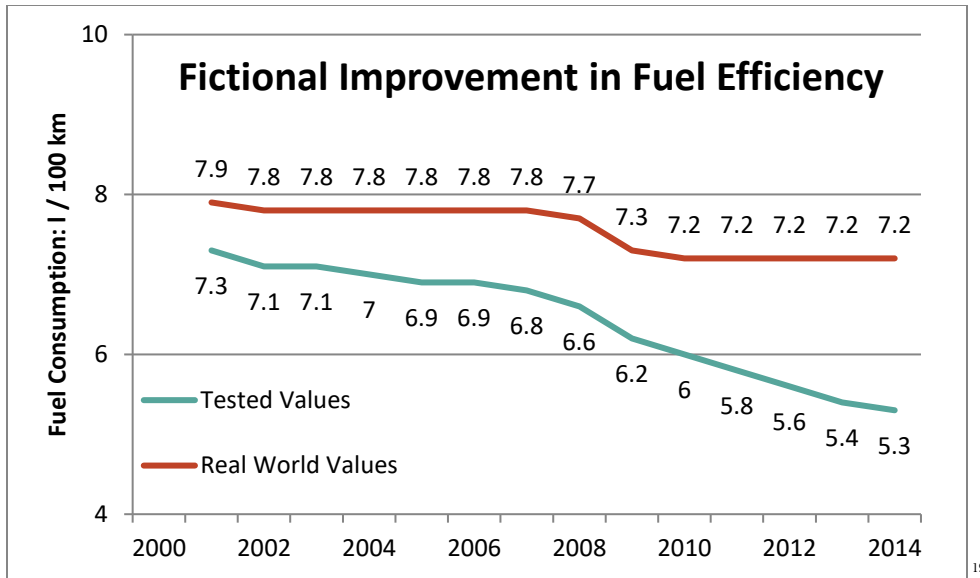
- **Pathways to catastrophic problems open up.** When even the worst offenders are not sanctioned by the regulators it becomes standard practice to be non-compliant with regulation. Companies push and push the limits until one of two things happen: the regulator finally begins to enforce regulations or a catastrophic incident occurs. The risk of catastrophe increases when deviance is normalized.
- **Public trust in regulators and other authorities is crippled.** European regulators have been assuring the public and government officials that pollution levels from diesel automobiles were controlled even though this has not been true for many years. Distrust in one regulator contaminates trust in other regulators and in other authorities. When people no longer trust police, regulators and government officials it makes less sense for them to follow the rules and more sense to act in a corrupt manner.
- **Social license in associated jurisdictions is severely weakened.** On November 2, 2016 the UK government's plan for reducing air pollution was found illegal by the High Court. The ruling judge, Mr. Justice Garnham, said that "over-optimistic pollution modelling was being used, based on flawed lab tests of diesel vehicles rather than actual emissions on the road."¹⁸ Through the ruling the government will be forced to enact plans it had delayed to charge diesel cars to enter towns and cities affected by poor air quality, or to take similar measures. Similar blowback has started to affect diesels in Korea, Australia and other jurisdictions and more problems will emerge in the next year.

Fuel Efficiency Improvements are Also Fictional

Europeans take automobile fuel efficiency seriously, but even in this important area emission improvements are mostly fictional. From 2001 - 2014 fuel consumption in the European auto fleet was reduced an impressive 27% when measured by emission lab tests. The real gain in fuel efficiency in that time period was a much more modest 8% when measured on the road.

As you can see in the following chart, real world fuel efficiency has stayed relatively flat while the tested values have improved significantly. The gap between the two has increased every year as manufacturers became more skilled at 'optimizing' the lab tests. Government policy and reporting on Europe's commitments in the Kyoto Protocol have relied on the increasingly unreliable tested values.

¹⁸ Carrington, Damian. (2016, November 2). High Court Rules UK Government Plans to Tackle Air Pollution are Illegal.



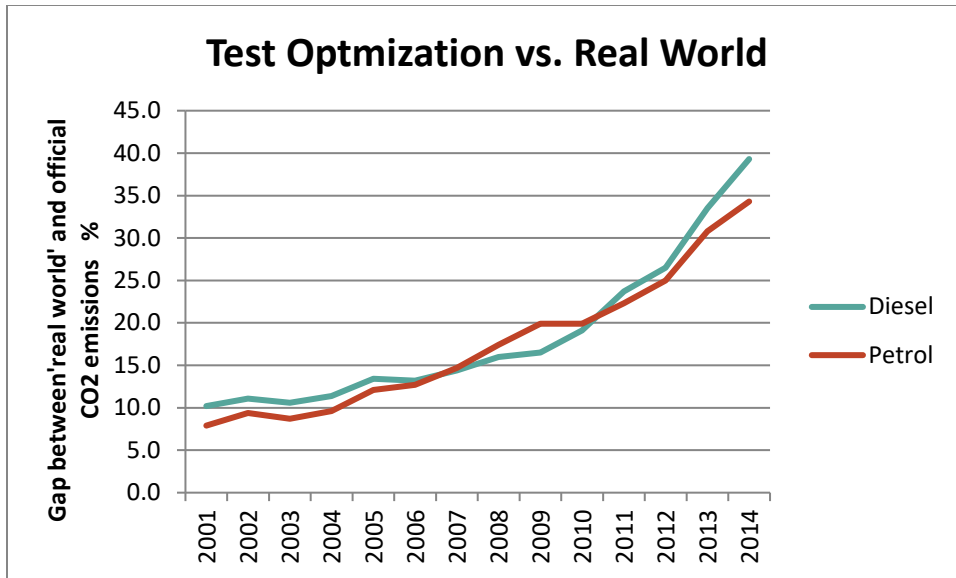
European consumers have protested the increasingly unrealistic and unattainable fuel consumption figures stuck on the windows of new cars in sales lots. Regulators have responded by saying that all manufacturers are tested using the same standards and so the figures should be comparable between vehicles.

The regulators have chosen to not take action to close the gap between tested values for fuel efficiency and the real world. For example, there is no audit of lab results and no penalty if lab results stray too far away from reality. As a result, manufacturers are competing on how creatively they can optimize the tests rather than on how well they can diminish fuel consumption.

The gap between fuel efficiency tests in the lab and performance in the real world has increased at the same rate for gasoline and diesel engines from 2001 - 2014 as you can see in the following chart¹⁹.

¹⁹ Tietge, Mock, Zacharof & Franco (2015). Real-world fuel consumption of popular European passenger car models. The International Council on Clean Transportation. Working Paper 2018-8

²⁰ Chart Source: (2015, Sept). Quantifying the impact of real-world driving on total CO2 emissions from UK Cars and vans. Final Report for The Committee on Climate Change. Element Energy Limited.



An industry of test optimizing companies has emerged in Europe, helping the manufacturers produce increasingly unrealistic results in the lab.

Gaming the Tests

The car manufacturers are not doing anything illegal in optimizing emission and fuel efficiency tests. The BBC pointed out in 2013 that acting illegally is not necessary. “They don’t need to. . . . The current test procedures are so lax there is ample opportunity to massage the test results²¹.”

Manufacturers contract with specialized testing organizations that compete on their ability to produce good results. The results have improved over the years using quite surprising, and legal, methods such as:

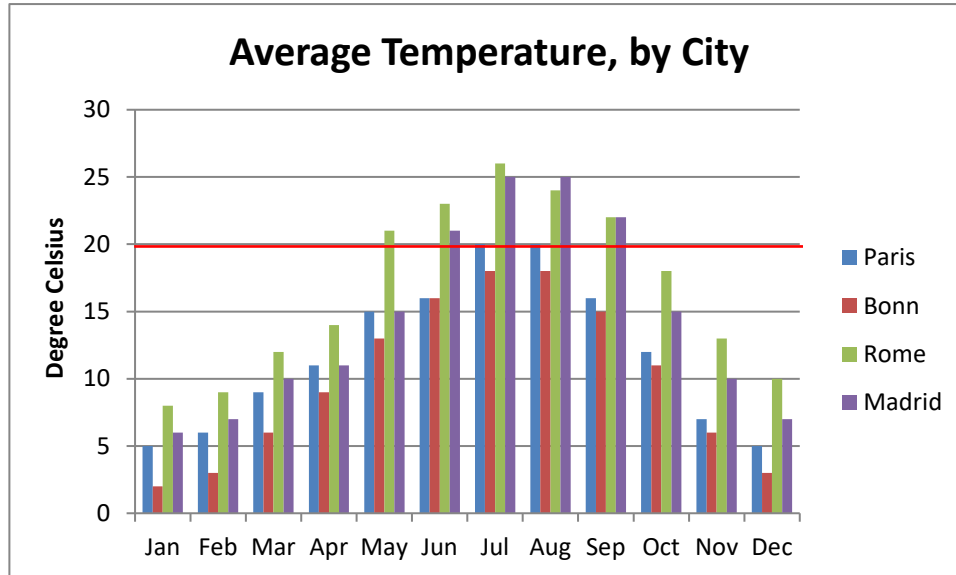
- Manufacturers use prototype vehicles rather than production vehicles in the testing
- Special lubricants that would destroy an engine over long use are used to reduce friction during the tests
- Brakes are disconnected to reduce friction
- Slick tires that would never be used on the road are pumped hard to reduce rolling resistance
- Outside mirrors are removed, doors and headlights taped over to reduce wind resistance
- Alternators are disconnected to eliminate power consumption
- Spare tires and seats are removed to reduce weight
- Vehicles are tested on a one degree slope

Enforcement of the testing process is left to the 28 national regulators in the EU and manufacturers can decide which regulator to use. Each regulator allows manufacturers to self-report without any post-testing audit.

This system of self-regulation without enforcement produces farce. For example, the regulations allow emission controls to be shut down in situations where the controls would damage the engine. One of these situations is cold temperatures. This year a German government study discovered a Jeep

²¹ Madslie, Jorn (2013, March 14). Carmakers Manipulate Emissions Tests. BBC Business.

Cherokee sold in Europe by Fiat Chrysler shut down its emissions control at 20 degrees Celsius, and then emitted 12 times the allowed NOx pollution. In response to this study “The Italian minister of transport, Graziano Delrio, said the government’s own tests showed Fiats were legal and that Germany had no standing to maintain otherwise²².”



It just happens that the lab tests occur at temperatures 20° C and higher. The Jeep’s NOx emission controls operate in the lab atmosphere but they shut off outside the lab whenever the temperature dips below 20° C. In the four cities charted above the average temperature is under 20° C roughly 80% of the time.

The original purpose of Europe’s emission and fuel efficiency laws was, presumably, to reduce emissions and fuel consumption in Europe’s auto fleet. There has been no reduction in NOx emissions from passenger diesels since the first Euro 1 limits were imposed in 1992, although every car on the road has passed the required emissions lab test.

There was not a single Euro 5 passenger diesel tested by the UK Ministry for Transport that complied with the Euro 5 NOx emission limits. VW’s vehicles were generally in the middle of the pack—many models from other manufacturers were much worse polluters than those from VW.

New Emissions Test Procedures, and the Conformity Factor

There is some hope that the EU emission testing system can finally become a force for reducing vehicle emissions. The 1990’s era New European Drive Cycle (NEDC) will be replaced by a more rigorous system in 2017. Even the manufacturers appear to be supportive of the change, as one spokesperson observed, “The differences between the results from official laboratory tests and those performed in the real world are well known, and industry acknowledges the need for fundamental reform of the current official test regime, which does it no favours²³.”

²² Ewing, Jack (2016, June 9) Volkswagen Not Alone in Flouting Pollution Limits. NY Times

²³ Walker, Peter & Ruddick, Graham (2016, April 21). Spokesman for The Society of Motor Manufacturers and Traders (SMMT) quoted in Diesel Cars’ Emissions Far Higher on Road than in Lab, Tests Show. The Guardian.

The need for serious reform has been known for many years. Serious work to replace the flawed NEDC began in 2008. Implementation of the new system was initially scheduled for 2014 but this was postponed because the manufacturers were not ready for tests that were more connected to real emissions.

If things now work to schedule, on September 2017 NEDC will be replaced by two testing systems. The lab test for both gasoline and diesel cars will use the more robust Worldwide Light Vehicle Test Procedure (WLTP). Additionally, passenger diesels will undergo Real Driving Emissions tests (RDE) for NOx and particulate emissions.

Upgrading the lab tests from the 1990 NEDC standard should have an immediate effect. ICCT predicts the introduction of the tighter WLTP standards will reduce the gap between the lab and real world performance to 23% from the current 40%. Manufacturers will still use prototype vehicles and will self-report the results with no audit but the WLTP tests will be much harder to game.

The Real Driving Emission tests (RDE) for diesels should tighten the testing process even further. RDE will measure tailpipe emissions of diesels driven on roads and streets, using portable testing gear. The tests will be very similar to the ones that uncovered VW Dieselgate in California in 2014. CO2 emissions will be monitored during RDE tests but will not be included formally until 2022.

The more restrictive Euro 6 emission limits will be implemented at the same time as the new testing regime. Once Euro 6 is implemented the regulatory path for diesel and petrol powered engines will converge as planned during the introduction of Euro 1 in 1992. With Euro 6 the allowed emissions of NOx and particulates are very similar for diesel and petrol engines.

The new testing process looks hopeful, but it will be enforced by the same regulators that allowed the previous system to become disconnected with reality. The manufacturers and the testing industry have become experts at appearing to reduce emissions and it is unlikely that they will put their engineering emphasis on actually reducing emissions without some enforcement action. If the regulators are deeply captured, the new system will make little difference in the real world.

The Conformity Factor

One truly hopeful sign that the new emission testing system may force real world emissions reductions is the serious resistance to implementation put up by manufacturers. Even though they had been part of the system design since 2008, industry refused to implement in 2014, saying technology was not yet ready. Then, when it appeared no further delays would be allowed past 2017 manufacturers and their national governments threatened to boycott the new system.

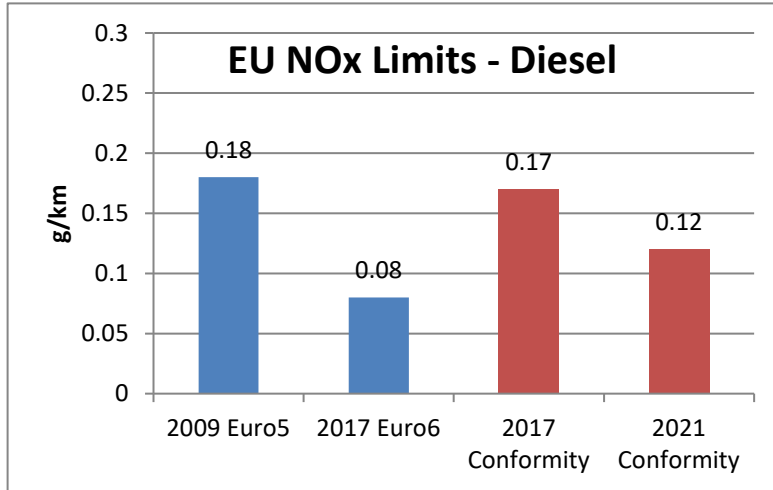
After a long tough battle in the European Parliament a compromise was reached on February 6, 2016. National governments and the auto manufacturers agreed to implement Euro 6 emission limits and the new testing regimes (WLTP and RDE) if a 'Conformity Factor' is allowed²⁴.

²⁵

²⁴ Nelsen, Arthur. (2016, February 3). EU Parliament Fails to Close Loopholes in Controversial Car Emission Tests. The Guardian.

²⁵ Source: https://www.theaa.com/motoring_advice/fuels-and-environment/euro-emissions-standards.html

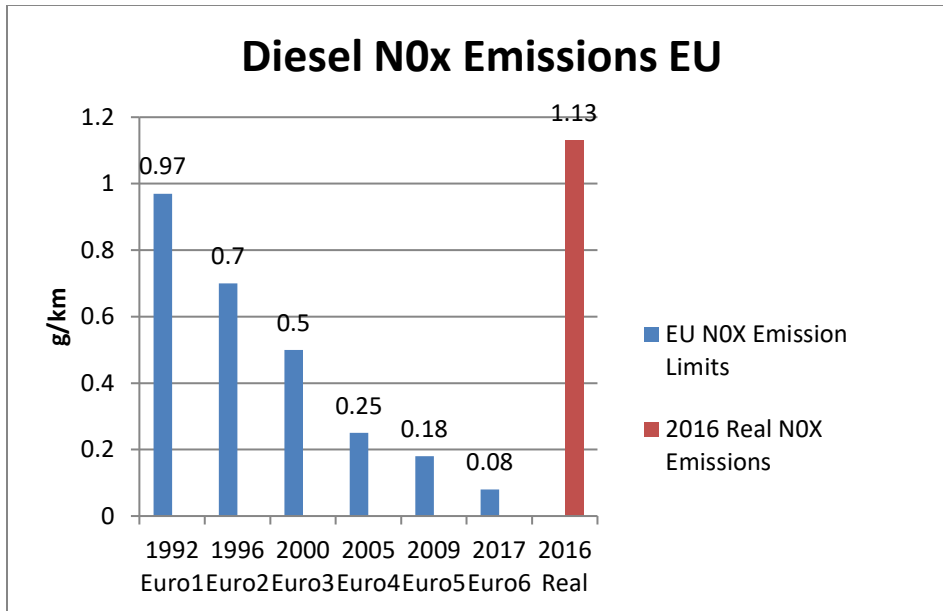
The Conformity Factor permits NOx emissions to be 110% more than Euro 6's legislated limit of 0.08 g/km until 2021 and then 50% more than the limit thereafter. What this means is that the NOx emission limits, including the 'Conformity Factor,' will stay essentially the same as the 2009 Euro 5 limit until 2021.



The argument for a 'Conformity Factor' could only make sense with a captured regulator. Supporters argue that no diesels ever met the 2009-16 Euro 5 emission limits while driving on the roads. Now with the imposition of the Real Driving Emissions testing cars will be expected to control emissions on the road as well as in the lab. Thus, if vehicles meet the Euro 5 standard of emissions (Euro 6, with a Conformity Factor) the actual emissions will be lower than they ever have been.

It will be a real achievement if passenger diesels in Europe begin to control NOx emissions on the road once the RDE tests are implemented. This would finally move NOx emissions control from the realm of fiction to that of reality. Real world NOx emissions from the 37 most popular passenger diesels measured by the UK Ministry for Transport averaged 1135 mg/km in 2016²⁶. This was 16% above the 1992 Euro1 levels and 520% above the 2009-16 Euro5 level.

²⁶ (2016, April). Vehicle Emissions Testing Programme. Department for Transport, UK. Cm 9259.



It is small wonder the industry lobbied, and received, permission for a Conformity Factor when contemplating the spectre of Real Driving Emissions testing. It is still to be seen if the diesel vehicles conform once RDE is implemented.

Doveryai, No Proveryai

On December 8, 1987 U.S. President Ronald Reagan and Soviet President Mikhail Gorbachev signed the Intermediate-Range Nuclear Forces Treaty (INF Treaty). The treaty eliminated all land-based nuclear and conventional missiles with ranges of 500 to 5,500 kilometers. By May 1991, 2,692 missiles were eliminated, followed by 10 years of on-site verification. The INF Treaty made the world a much safer place.

During the arms control negotiations President Reagan frequently brought up an old Russian proverb, using the only Russian words that he knew. The proverb, “Doveryai, no proveryai,” became a foundational element for the negotiation and the subsequent treaty. The English translation is ‘trust, but verify.’

Fans of regulatory simplification often remember only the first part of the proverb and ignore the second. It is true that trust is essential to the workings of any regulatory system, but trust is not enough. The European automobile emission regulatory system has failed because it was built without any mechanism to verify that trust was justified.

Volkswagen is not a rogue company in Europe. VW is joined by all manufacturers selling passenger diesels in Europe in the construction and maintenance of a fictional emissions control system. Regulators and national governments continue to prop up this sham by announcing more stringent emissions limits that they know will never be met outside the lab. A captured regulator has brought out the very worst in some of our most cherished and honoured corporations.

Remember Who Benefits and Who is Harmed by Regulatory Capture

It is possible to get lost in Dieselpgate and its sister story about emissions control failure in the European auto industry. Dieselpgate is a tale of clean diesels that are dirty, cover ups, sophisticated software hidden in engines, and a world famous corporate brand caught cheating. And Dieselpgate has exposed a vast conspiracy of big companies, governments and regulators working together to pretend to control emissions in Europe.

We must remember the real harm that resides just outside all the intriguing detail of these stories. Thousands of people in urban areas around the world are getting sick and dying because of NO_x pollution from fancy new cars. Very few of most affected people can afford to own or drive new diesels. They just get to breathe the polluted air.

Appendix

Appendix 1: U.S. Regulators

The U.S. regulators stood up to VW's efforts to make them irrelevant in 2014 and 2015. Without their solid defensive work Dieselgate would not have hit the press and more importantly the regulatory foundations in the U.S. auto industry would have seriously weakened.

EPA and CARB are important players in this story, but they are far from perfect. After all, their testing process failed to discover that a total of 482,000 VW passenger diesels were each emitting roughly twice the NOx emissions of a city bus²⁷ from 2009-15. These emissions were up to 40 times the U.S. limit of NOx for a passenger vehicle—not a small oversight. Fortunately this plume of emissions was noticed by the small non-profit environmental organization ICCT.

Once the VW emissions gap was exposed, the U.S. regulators did their job very capably. CARB led the technical work, searching for the cause and scope of the problem. EPA supported CARB and when all options for cooperation were resisted by VW, EPA brought in its very strong enforcement power. EPA declared in July 2015 that none of VW's diesels would be approved for sale in the upcoming year unless VW provided a credible explanation for CARB's technical findings. This move surprised VW and cracked its resistance. On September 3, 2015 VW signed a statement that their diesel cars sold in the U.S. from 2009 - 2015 contained defeat devices and Dieselgate was born.

The VW executives could have avoided a whole world of trouble if they had paid attention to their regulatory people prior to re-entering this market in 2008. They would have heard that vehicle emissions are a foundation element in the history of both CARB and EPA and that both take their enforcement roles in this area very seriously. A short history of both agencies follow, so the reader can see what VW was messing with.

California Air Resources Board

The California Air Resources Board (CARB) set the U.S.'s first motor vehicle emissions standards in 1967 and has been a leader in emissions control ever since. Officially, national auto emissions are regulated by the Environmental Protection Agency (EPA) but the 1967 California Waiver allows the state to set its own, higher, emission standards. CARB's tighter standards are the de facto national limits because California is such a big market (twice that of Canada) and it is too expensive for industry to meet two sets of standards in the one country.²⁸

California became a world-wide leader in emission control because it was the first area in the U.S. to suffer from severe smog. Los Angeles has unique weather patterns that trap smog gasses and this combined with rapid growth to produce a serious public health problem in 1943. Initial action was directed at point sources of pollution such as refineries and factories. But smog problems continued and it became evident that emissions from automobiles and trucks would also have to be controlled.

²⁷ 2010 EPA emissions standards for transit vehicles = 0.58 g/km NOx. Source: <http://www.wrirosscities.org/sites/default/files/Exhaust-Emissions-Transit-Buses-EMBARQ.pdf>

²⁸ In 2016 EPA has adopted the CARB emissions standard for the 2016 model year and is working on joint standards with CARB for model years 2017-2025.

California scientists and universities developed leading expertise in understanding the dangerous components of smog and their many sources.

In 1967 the California Air Resources Board was signed into existence by Governor Ronald Reagan to achieve state-wide action on air emissions. By 1969 CARB was the first regulator in the nation to set standards for ozone, nitrous oxides, sulphur dioxide, carbon monoxide and particulate matter emissions. These standards were applied to vehicles and tightened over time so by the mid-1980's California had the world's cleanest-running car and truck fleets. Smog alerts in Los Angeles shrunk from 148 in 1970 to zero in 2000 even though the number of vehicles in California increased in that time from 12 million to 23 million.

CARB takes its pioneering role in reducing air emissions seriously. Its mandate flows from the California Motor Vehicle Pollution Control Act (1959) and now includes emissions from industry, heavy transport, port activity, marine vessels and municipalities as well as from autos. It was the first U.S. regulator to: require catalytic converters (1975); declare particulate matter from diesels to be toxic (1998), ban MBTE and lead in gasoline (1999); require low sulphur diesel fuel (2003). Since 2006 CARB has also been responsible for monitoring and reducing greenhouse gasses in California but the reduction of smog-producing emissions remains the core of its work.

EPA

U.S. federal restrictions on air emissions followed the path set by California. The federal Clean Air Act was passed in 1965 and its 1968 regulations adopted California's 1965 emissions standards. In 1970 the federal Environmental Protection Agency (EPA) was signed into existence by Richard Nixon.

The EPA's auto emission standards typically lagged those of CARB by a few years but EPA build solid national standards and provided fairly vigorous enforcement. EPA's first Administrator, William D. Ruckelshaus, said the following in his Congressional confirmation hearings in 1970, "I think that enforcement is a very important function of this new Agency. Obviously, if we are to make progress in pollution abatement, we must have a firm enforcement policy at the federal level.... [A]s far as I view the mission of this Agency and my mission as its proposed Administrator, it is to be as forceful as the laws that Congress has provided, and to present...firm support [for] enforcement [by] the States."²⁹

Fuel economy standards followed emissions, but they became an important part of EPA's work in the mid 1970's when oil prices jumped with the formation of OPEC. National corporate average fuel (CAFE) standards were enacted in 1975 and increased over the years, moving from 27.5 mpg for cars in 1985 to 54.5 mpg by 2025. EPA's work on fuel economy standards was formally linked to the federal Climate Action Plan in 2013. EPA is one of the lead agencies involved in the reduction of carbon dioxide emissions.

The EPA is now a massive agency with roughly 15,000 employees and a 2015 net cost of operations of \$8.7 billion. EPA's mandate includes air pollution, chemical safety, water and solid waste. A large percentage of its budget is spent on remediation of massive and complex pollution in 'Superfund' sites. In its climate action work EPA is tasked with reducing carbon pollution from electric power plants, reduce methane emissions from oil and gas production and municipal landfills, and improving fuel efficiency for medium and heavy-duty vehicles.

²⁹ (1992) Origins of the EPA. EPA Historical Publication - 1. <https://www.epa.gov/aboutepa/guardian-origins-epa>

U.S. Auto Emissions Testing

The Environmental Protection Agency (EPA) is responsible for testing of automobile fuel economy and emissions in the U.S. The EPA testing system is pretty straightforward, and it works pretty well. EPA sets standards for the tests, manufacturers do the testing and submit results to the EPA, EPA conducts its own tests on a random sample and EPA enforces fairly harsh penalties when the manufacturers report inaccurate results.

Pre-production models of new vehicles are tested prior to sales at dealers. EPA sample tests these models in their own labs and follows up with production vehicles using rental cars, dealer loans and cars borrowed with a fee from owners. Once the tests of production cars are complete, they are returned cleaned, with a full tank and an oil change.

When the EPA finds a discrepancy between manufacturers' claims and the EPA tests, it acts. It tries to work out a cooperative settlement with the offending manufacturer first of all, and has done so with Ford, Mercedes, GM and most large manufacturers. In November 2004 it fined Hyundai and Kia \$100 million and forced them to forfeit regulatory credits worth \$200 million for overstating fuel economy claims in a range of 1 to 6 miles per gallon.³⁰ Hyundai-Kia also agreed to set up an independent certification group to audit their 2015 and 2016 fleet mileage claims.

The EPA lab test procedures were tightened considerably in 2008 to better reflect real driving situations. Prior to this the lab tests included only two driving cycles with unrealistic acceleration rates and driving speeds in standard conditions of 75 degrees Fahrenheit. The upgraded five cycle tests added three additional driving cycles, including more aggressive driving, air conditioner use and cold temperature driving.

VW designed its defeat devices to fool the EPA's upgraded five cycle lab tests. Their 'Clean Diesel' engines passed EPA tests for NOx emissions from the time they were introduced in 2008 until the defeat devices were discovered in 2014. In late 2015, the EPA began conducting on-road tests to check lab results, starting with VW vehicles. In November 2015 the road tests revealed and additional 10,000 VW, Audi and Porsche models containing the defeat devices.

EPA intends to continue road tests as part of their audit system. Initially these tests will focus on 2015 and 2016 model year diesel cars and then they will be expanded to all new cars that manufacturers seek to certify. EPA will use the road tests to catch cheaters and to verify the results of the lab tests. When asked about the road test procedures, EPA executive Christopher Grundler said, "Manufacturers have asked us what the test conditions would be, and we've told them that they don't have a need to know. It will be random."³¹

The EPA testing system is much more robust than Europe's but it has had some very large loopholes. The largest gap was in the Corporate Average Fuel Economy (CAFE) regulations which were enacted by Congress in 1975 to improve the fuel economy of cars and light trucks. The 1975 legislation enacted a separate standard for light trucks because they were primarily working vehicles and not a large part of the vehicle fleet. From that point on, vehicles build on light truck platforms were granted far looser standards than automobiles for fuel economy, passenger safety and emissions. The SUV was born on this loophole and with it the market share of 'light trucks' increased from 9.7% in 1979 to 47% in 2011.

³⁰ White, Joseph. (2014, November 3). U.S. Fines Hyundai, Kia for Fuel Claims. The Wall Street Journal

³¹ Hakim, Danny & Mouawad, Jad (2015, November 8) Galvanized by VW Scandal, E/P.A. Expands on-road Emissions Testing. The New York Times.

Attempts to close the SUV loophole were foiled by intense lobbying and court challenges until it was finally ended with the Energy Independence and Security Act in 2007. Since that time CAFE standards have tightened significantly for the light truck category.