

SE101 Lecture 8: Volkswagen

Patrick Lam

Thursday, October 25, 2018

Context





Highlights of the IPCC Fifth Assessment Report

IPCC AR5 Synthesis Report

ipcc
INTERGOVERNMENTAL PANEL ON climate change





Diesel: pluses and minuses

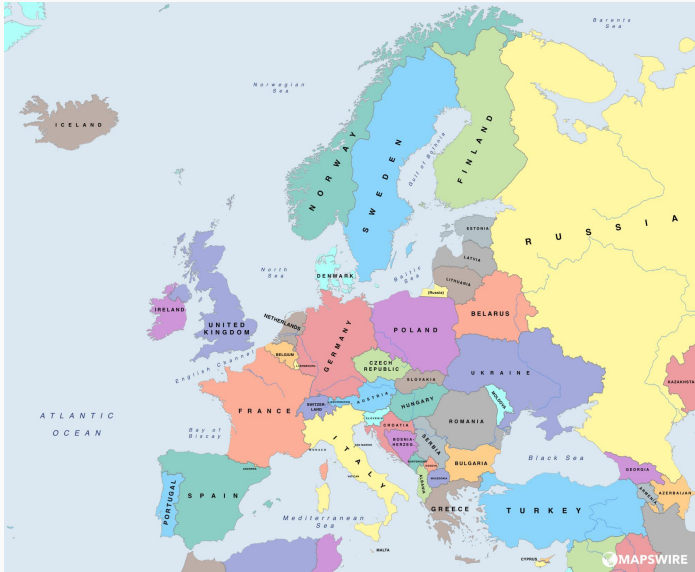
+ 10-20% less CO₂/km

+ more torque

- more NO_x

- more PMs
(soot)

Do People Drive Diesels?



reached 50% of market



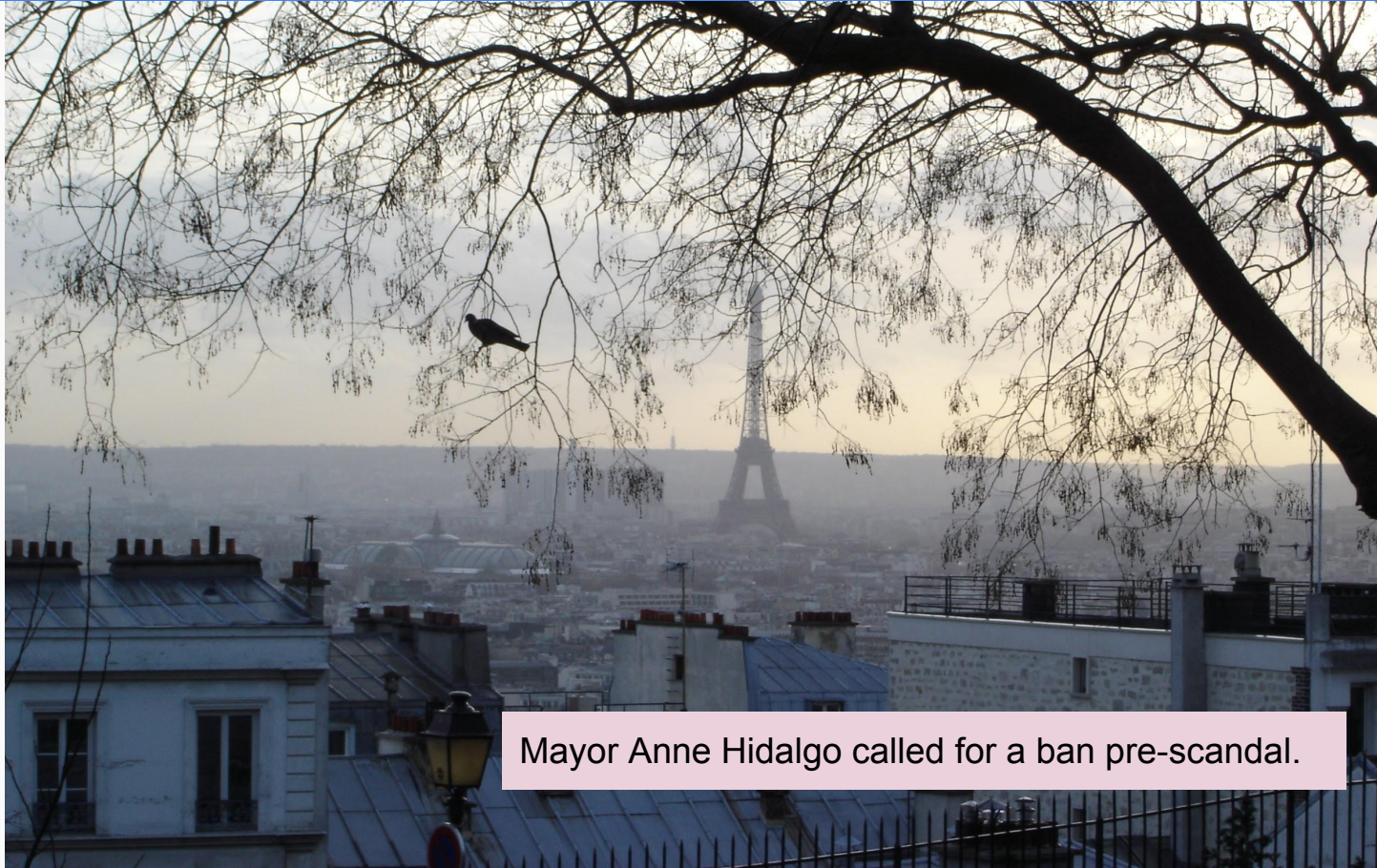
peaked at 3% of market

... and yet.



<https://notalotofpeopleknowthat.wordpress.com/2015/06/28/black-soot-on-my-car/>

Paris also suspicious of diesel...



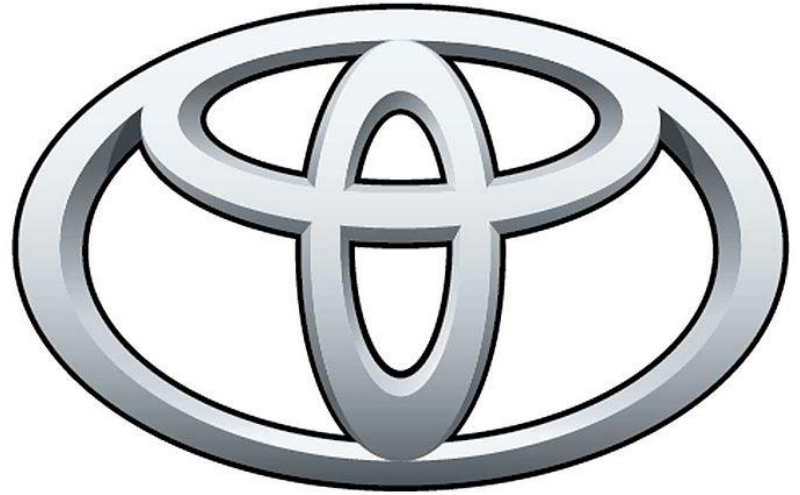
Mayor Anne Hidalgo called for a ban pre-scandal.

Proposed diesel bans in 2018



The Issue

The Goal:



United States Law:



because



TDI[®] Clean Diesel



How?



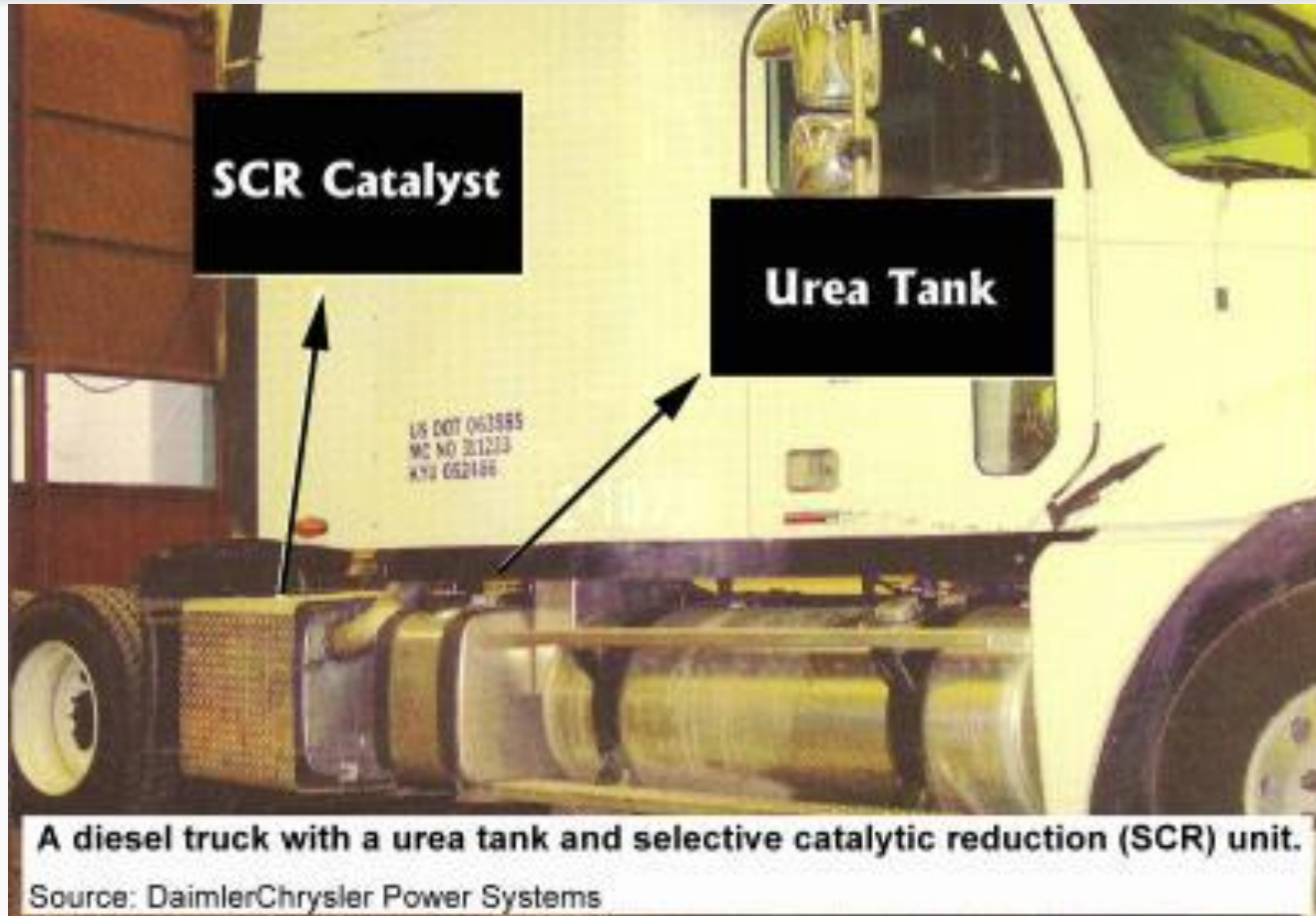
via



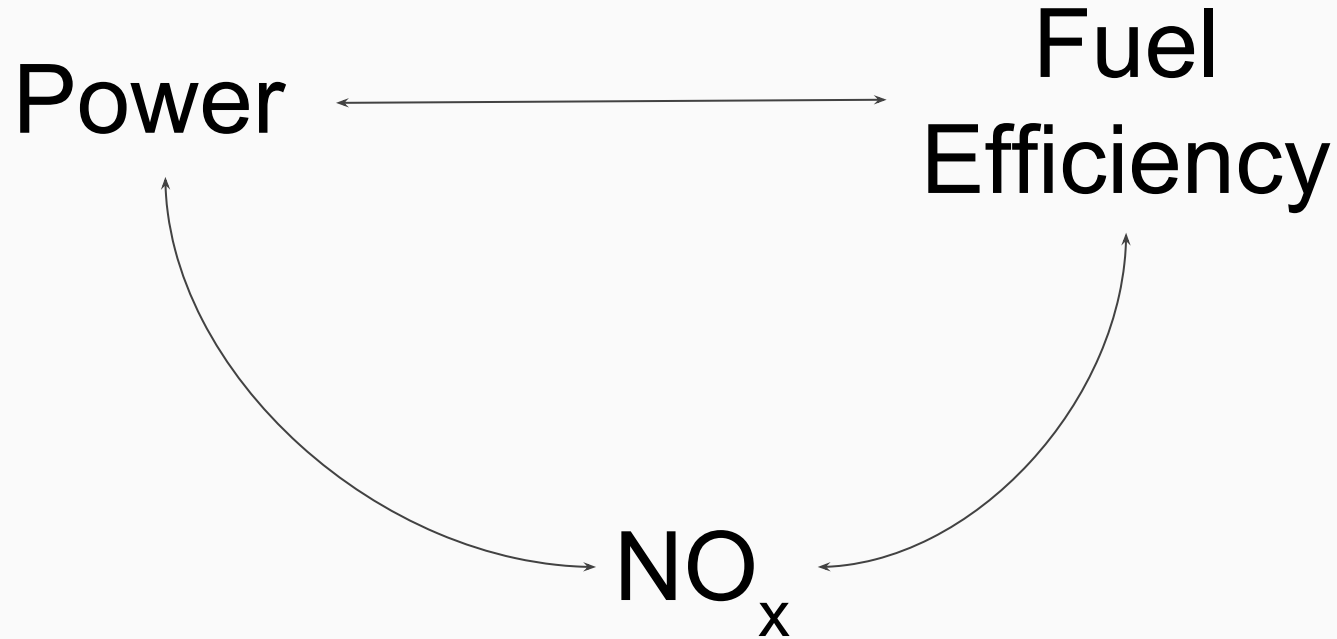
But...

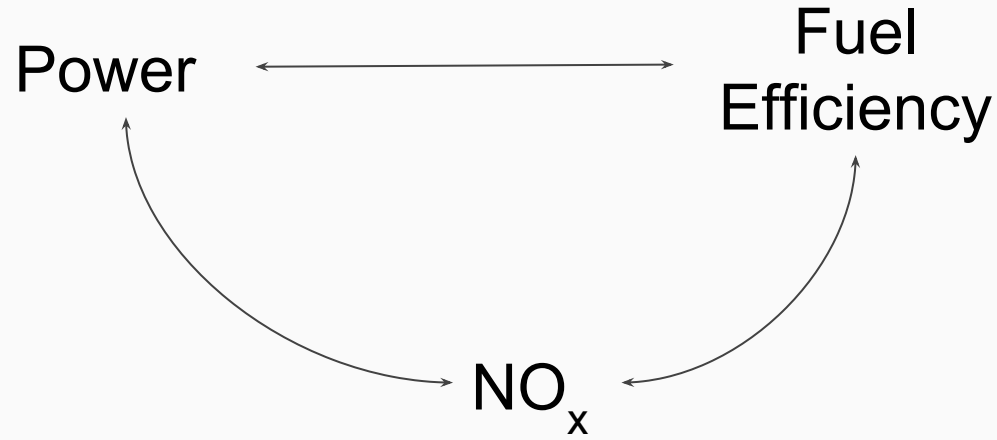
Catalytic converters only work on
gas engines!

Alternative for diesel: SCR

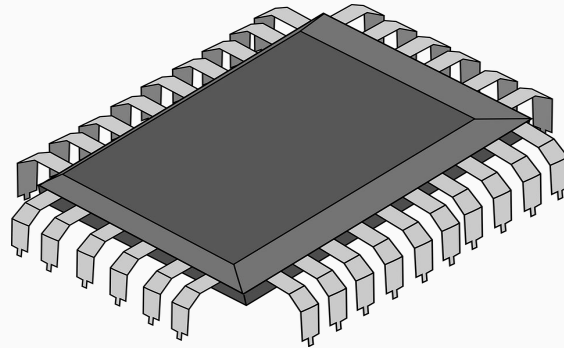


Engineering Tradeoffs...





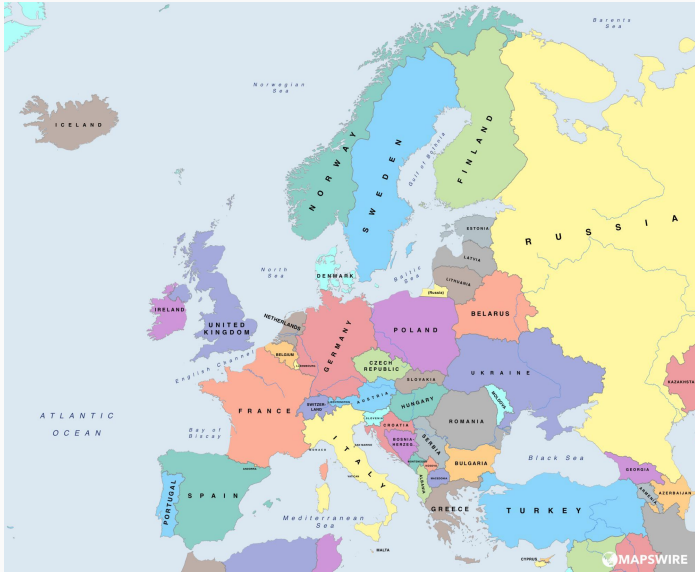
mediated by...



(Because it's 2018!)

Discovery

How do US cars satisfy emissions rules?



less strict



more strict!

Professor Dr. Ferdinand Dudenhöffer



Hmm...

Afterwards:



They must have known that it's impossible, or else it's not possible they have degrees as engineers.



hires



(West Virginia University)

In-Lab

On-Road



5x-35x over
target!



24th CRC REAL WORLD EMISSIONS WORKSHOP

SESSION 10: Emissions Control Measures, I/M, and OBDII

11:50 AM *Introduction by Session Leader Phil Heirigs, Chevron Global Downstream*

■	11:55 AM	Effect of Engine Efficiency Improvements on Aftertreatment Performance and Greenhouse Gas Emissions	Pragalath Thiruvengadam	West Virginia University
■	12:10 PM	Results of Analysis of On-Board Diagnostic System Trouble Codes	Carl Fulper	U.S. Environmental Protection Agency
■	12:25 PM	I/M vs. Non-I/M MIL Behavior in Oregon	Gene Tierney	Opus Inspections

Regulators & Consequences





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

SEP 18 2015

OFFICE OF
ENFORCEMENT AND
COMPLIANCE ASSURANCE

*VIA CERTIFIED MAIL
RETURN RECEIPT REQUESTED*

Volkswagen AG
Audi AG
Volkswagen Group of America, Inc.
Thru:

David Geanakopoulos
Executive Vice President Public Affairs and General Counsel
Volkswagen Group of America, Inc.
2200 Ferdinand Porsche Drive
Herndon, VA 20171

Stuart Johnson
General Manager
Engineering and Environmental Office
Volkswagen Group of America, Inc.
3800 Hamlin Road
Auburn Hills, MI 48326

Re: Notice of Violation

Dear Mr. Geanakopoulos and Mr. Johnson:

The United States Environmental Protection Agency (EPA) has investigated and continues to investigate Volkswagen AG, Audi AG, and Volkswagen Group of America (collectively, VW) for compliance with the Clean Air Act (CAA), 42 U.S.C. §§ 7401–7671q, and its implementing regulations. As detailed in this Notice of Violation (NOV), the EPA has determined that VW manufactured and installed defeat devices in certain model year 2009 through 2015 diesel light-duty vehicles equipped with 2.0 liter engines. These defeat devices bypass, defeat, or render inoperative elements of the vehicles' emission control system that exist to comply with CAA emission standards. Therefore, VW violated section 203(a)(3)(B) of the CAA, 42 U.S.C. § 7522(a)(3)(B). Additionally, the EPA has determined that, due to the existence of the defeat

40p
1

NATIONAL NEWSPAPER

Toxic scandal on our roads

The essential daily briefing
FROM THE INDEPENDENT

WEDNESDAY
23 SEPTEMBER 2015
Number 1,000

independent.co.uk
twitter: @theindependent
facebook.com/theindependent

- » Millions may be driving UK vehicles that breach pollution targets
- » Transport Secretary demands EU-wide inquiry into car industry
- » VW sorry after world's largest car-maker is caught rigging tests



NEWS
Pig-gate
PM's military record now under fire



HEALTH
Entrepreneur
hikes cost of life-saving drug by 5,500%



MUSIC
Shang-A-Lang
again? Return of the Rollers

P6

Sport

RUGBY WORLD CUP

Who can fill Joseph's big boots?



Lifestyle lowdown

Michel Roux Jr on his new television series plus the latest designer must-haves for the season



THE

NEWSPAPER OF THE YEAR



TIMES

Wednesday September 23 2015 | thetimes.co.uk | No 7070

Only 80p to print members £1.20



2 London fashion special
The shoes! The bags! The front row!

Plus Are you wearing the new midis?
The fashion editors' heels

Volkswagen in meltdown after faked diesel tests

rivers face mass recall as share price crashes

Neil Lea Industrial Editor
Anne Patten
report Correspondent

thousands of thousands of Volkswagen cars in Britain are facing a mass recall after the carmaker spread around world yesterday.

German company admitted that fleet of its cars worldwide were part of a scam in which it delivered the testing of its diesel cars for toxic emissions.

VW Group suffered a heavy blow on Frankfurt stock exchange, with its share price falling 20 per cent for the first consecutive day. A total of \$1.1 billion has now been wiped off the value of the company since the start of the crisis.

Richard Winterton, VW's chief executive, reiterated his earlier apologies for the scandal, saying that he was "indiscreet" for the wrongdoing.

Friday the US Environmental Protection Agency said that VW diesel cars had emitted more than 10 times the amount of nitrogen oxides than allowed.

Half a million cars in the US alone. The agency found a "cheat" that allowed diesel VWs to emit less during tests than they did in real life.

New York attorney general has ordered an investigation into the scandal also called on the EU to inquiry, amid fears that other carmakers may have been cheating in tests.

After the European Commission's McGowan, the transport secretary, said that officials must "take swift action to avoid a recurrence".

He added: "Public confidence is vital."

The commission said that it was waiting for the outcome of an investigation by the German government into VW and some of the country's other manufacturers. It confirmed, however, that it would reform the EU emissions testing regime early next year.

VW has announced that it is to set aside €15 billion to correct emission "discussions", potential fines from regulators and possible legal claims from customers or rivals.

The company's British operation said that it had not received orders from global headquarters in Wolfsburg over its customers or whether there would be recalls of cars to adjust those whose engine levels are above the permitted 100ppm. Emissions are known to be a cause of respiratory conditions such as asthma.

The diesel model under investigation for having software designed to manipulate regulations are the VW Golf, Beetle, Passat, and Jetta built between 2009 and last year. In the VW sister brand, the Audi A3 is also implicated. VW Group indicated that models in its other volume brands, Skoda and Seat, may also be under scrutiny.

VW Group is by some way the biggest seller of cars, and of diesel variants, in Britain. VW, Audi, Skoda and Seat account for about a fifth of all UK new car sales — about 500,000 a year.

An speculation grew over whether other carmakers had been engaging in similar practices, shares in BMW and in Daimler, the maker of Mercedes-Benz, also fell.

Michael Hoon, VW's American chief, said earlier: "Our company was



WH Smith is forced to end hospital shop 'rip-off'

Lucy Bamberman, Neil Johnston

WH Smith will cut the cost of some goods in its hospital shops after it emerged that patients and visitors were often charged more than on the high street.

Get well-soon curbs were sold at the retailer's branch at Bristol Royal Infirmary for nearly twice as much as a high street outlet nearby, an investigation by The Times found last month.

A packet of Marsbar chocolates cost £2.99 at WH Smith at Merton hospital in Swansea compared with £2 at the nearest high street branch; a can of Coca-Cola was 79p in the same hospital but 60p elsewhere.

The revelations led to claims that customers in hospitals — many of them sick or under strain — were being "ripped off", despite having little choice about where to shop.

WH Smith has signalled that prices will be checked to ensure that the difference between identical items in hospital and high street shops is no more than 1-2 per cent.

The retailer said that it would extend promotions to hospital outlets, so that all customers had the benefit of the same reduced prices.

Paula Shaw, the MP who led calls to end price rises she said described as "outrageous and immoral, welcomed the assurances of transparency and urged other retailers to follow suit. Significant mark-ups were also discovered by The Times at Marks & Spencer hospital stores, though M&S said yesterday that it had no plans to alter its approach.

"Hopefully, these companies will now think twice before putting up prices in hospital shops," said Mr. Shaw.

Shaw, the Labour MP for Dewsbury and Mirfield who sits on the health select committee: "I look forward to hope they will enter into discussions in the same spirit. If they are not prepared to negotiate, this issue is important for many people who are fed up with the culture of commercialisation within hospitals.

The move came a month after the Department of Health urged NHS trusts and retailers to ensure that

VOW:GR Xetra
Volkswagen AG

+ ADD TO WATCHLIST

128.60 EUR

-9.70 -7.01% ▼

● MARKET CLOSED

AS OF 10/24/2018 EDT

1D

1M

6M

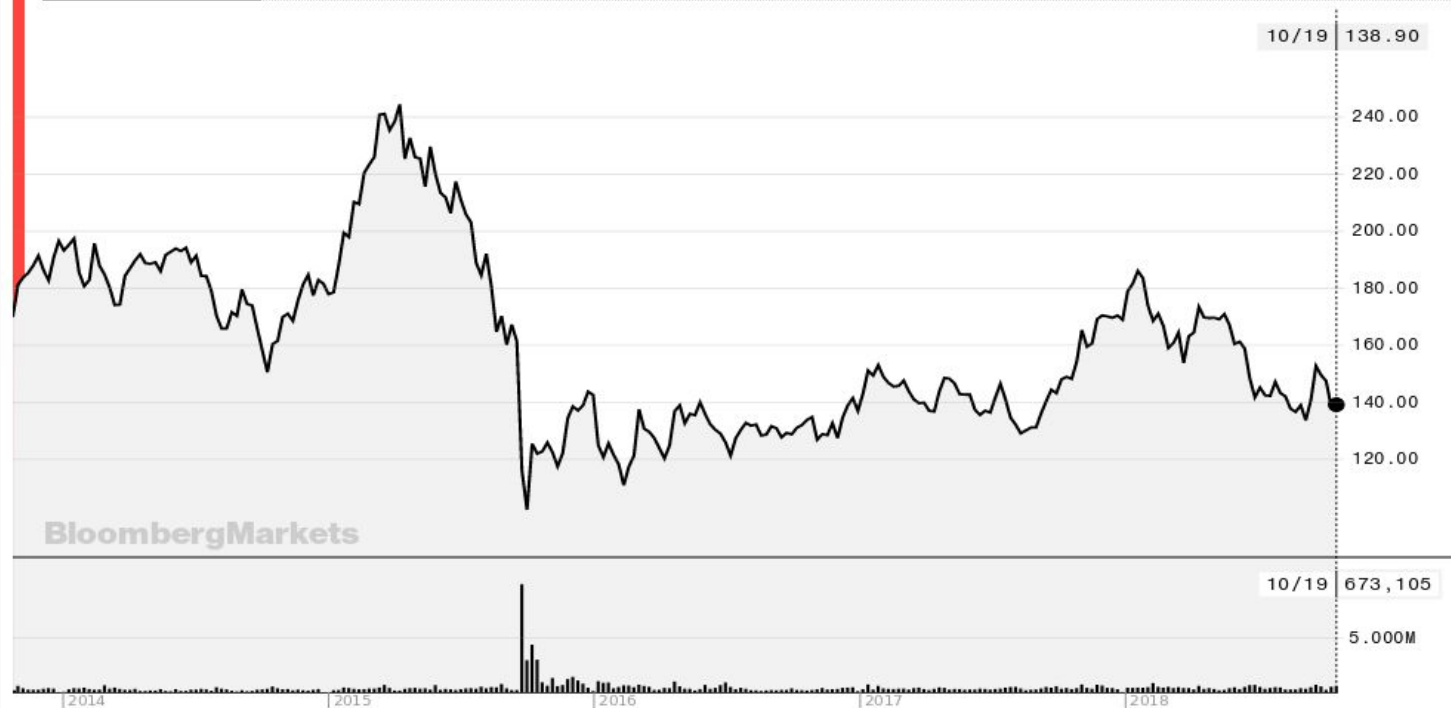
YTD

1Y

5Y

MINIMIZE CHART

Add a comparison 🔍



Engineering Discussion

How?

Software included “dyno calibration mode”:
IF it looks like car is being tested, THEN
↓ emissions, but also
↓ torque and ↓ efficiency

Written by software engineers with
engine designers.

Deeper Causes

Regulators: “objective” testing scheme,
but possible to hack.

Engineering trade-off:
urea tanks vs torque vs fuel efficiency

Deeper Causes

Senior management:

set specifications that were unachievable;
blamed rogue engineers.

VW is engineering focussed; claims of rogue engineers not credible.