Written questions to Mr Christopher Grundler (EPA) - EMIS hearing of 26/9/2016

No	Question
1.	After the revelations that the emissions from some VW vehicles were higher in real life tests compared to the laboratory tests, the EPA adapted its testing procedures and included a new test, the details of which it doesn't specify or explain. The EU also adapted its testing procedures and implemented RDE testing. Do you see an effect of the new testing procedures in terms of the number of new models of diesel cars being brought to the market in the US? How would you judge the effectiveness of the new test the EPA uses compared to the RDE test the EU will use in the future?
	We do not see our new testing procedures as having had a big influence on the type or number of new diesel models being introduced in the United States. Manufacturer decisions about which vehicle models to bring to market, and when, are extremely complex. These decisions involve many considerations including factors that have nothing to do with environmental regulation. Furthermore, decisions about product offerings are typically made years in advance of the actual product introduction. It is unlikely that manufacturers would change their near-term plans for diesel model introductions on the basis of the new EPA testing procedures alone. Indeed, several manufacturers have certified 2016 and 2017 diesel models since the Volkswagen defeat devices were revealed and since EPA announced the new testing procedures. One manufacturer, Jaguar-Land Rover, introduced a new 3.0L diesel models into the US market in 2016 and a 2.0L model in 2017. EPA issued certificates for all these vehicles only after performing a variety of tests to screen for potential defeat devices. The compliance testing protocols EPA is now using are robust and flexible. We test at three points in a vehicle's lifecycle, and we test using both laboratory and over-the-road methods. We continually update these procedures as circumstances change with the dual goals of simulating as closely as possible the way the car will be driven once in customer hands, and of keeping manufacturers guessing, making it more difficult for them to design emission control systems that behave differently on the EPA emissions test than in normal operation.
2.	The research service of the European Parliament analysed the legal obligations in relation to emission measurements in the EU automotive sector. It concluded that: "Independent in service conformity re-testing and the publication of the results, in particular, will give rise to a situation where OEMs are keen to ensure the proper functioning of emission abatement systems under real driving conditions. As a result, OEMs will strive to optimise their exhaust gas systems on the basis of real driving conditions and not in emission test situations on test benches." Are test results in the US public? Is there independent re-testing in the US? If so, does it exercise a pressure on OEMs to focus on real driving conditions instead of the laboratory tests that the US uses? The emissions data that manufacturers submit to EPA and that EPA collects through its official compliance testing programs are public and are available on the EPA web site. EPA does not typically release unofficial data or emission test results it collects as part of investigations, in part to prevent manufacturers from designing strategies to circumvent these tests. In the US, EPA selects and tests 20% to 30% of vehicle models each year at its National Vehicle and Fuel

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	Emissions Laboratory to confirm the emissions results that manufacturers have submitted. These "confirmatory" tests generally include 100% of vehicle models with new or atypical technologies (i.e., most new hybrid and diesel models are tested by EPA in their first year on the market). If EPA's results differ from the manufacturer's results, EPA's results become the official results. EPA tests cars for emissions compliance at three stages in the vehicle's life cycle. EPA initially assesses pre-production vehicles to confirm that the emission control system is well designed and that the vehicle meets all applicable emission standards. EPA also tests vehicles coming off production lines to check whether production vehicles match the pre-production designs EPA evaluated and approved. And EPA recruits vehicles from private owners and tests them to make sure that the cars remain clean in actual use, even after many years of operation. EPA's test cycles are designed to represent the broad range of conditions that vehicles will experience in normal driving and hence, force manufacturers to design vehicles that control emissions across the wide range of operating conditions described by the EPA test procedures. Because of the five cycle testing requirements, manufacturers must consider emissions performance and design vehicles to meet standards during vehicle operation in temperatures ranging from -7°C to 35°C with high thermal loads and speeds up to 129 km/hr.
3.	Where would you see the strengths and weaknesses in the U.S. vehicle emission testing and enforcement schemes? What does the regulator plan to improve in the near future? What does the EU need to improve in its regulation? Do you discuss differences in technologies of emission reduction systems with your European counterparts, or authorities of the EU member states or other authorities worldwide?
	A fundamental strength of the U.S. program is the broad authority and centralized oversight responsibility granted to EPA by the Clean Air Act, including the authority to enforce against violations of the law. In particular, EPA has a powerful tool kit in its ability to demand any information it deems relevant from manufacturers, to assess emissions performance at all stages of vehicle life-cycle (before cars go into production, while they are being produced, and after they have been sold to and used by customers), and to test vehicles in the laboratory over standard and non-standard cycles, as well as under real-world operating conditions. EPA's practice of considering vehicle and fuel regulations together is also a strength. As we are learning from the VW experience however, the U.S. program needs to continue to evolve along with technology including in ways that manufacturers can't predict. Last year, we expanded our compliance evaluation tool kit to include new test procedures and other kinds of checks to make it more difficult for manufacturers to circumvent EPA emissions requirements. We will continue to adapt and adjust our oversight methods in the future to both address changes in vehicle technology and design, and to keep manufacturers guessing. Ultimately it is important to design our emissions regulations and our measurement and enforcement protocols around actual emissions in real-world driving situations.
4.	Could you please elaborate in detail on how the market surveillance and the in-use emission testing programme is organised in the US? Who is responsible for conducting the tests? Are all these tests carried at the National Vehicle and Fuel Emissions Laboratory (NVFEL)? What are the criteria for choosing the vehicles to be tested - do you rely on statistical screening (reported anomalies) or is it rather done at random? What is the mode of financing of these monitoring activities? Does EPA use PEMS for controlling vehicle compliance with regulatory emission limits,

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	and if so, since when? On the basis of your surveillance data could you please tell us which vehicle emissions abatement technologies are considered the most effective? Please see attachment 1. EPA conducts its own testing of in-use vehicles, and also requires manufacturers to test and submit emissions data from their testing of vehicles already in customer service. We refer to our testing of customer-owned vehicles as our "surveillance program" and the manufacturer program, which is set forth in regulation, is known as the "In-Use Verification Program." EPA uses data from these programs to identify defects and other problems that are causing high emissions across a given vehicle model and that need to be addressed by the vehicle manufacturer (typically through a manufacturer emissions recall program to repair consumer vehicles). Local or regional areas that have high pollution levels are required to conduct inspection and maintenance (I/M) programs, which are designed and operated by states according to EPA regulation. I/M programs are designed to identify individual vehicles with high emissions so that they can be repaired by the vehicle owner. States share their I/M data sets with EPA, yielding another source of information about potential compliance problems. EPA conducts almost all of its standard surveillance testing at NVFEL, but will on occasion use contracted or partner facilities for specialized testing needs. EPA also partners with the California Air Resources Board and Environment Canada to broaden the scope of our oversight testing, sharing results to support each agency's independent oversight authorities. Manufacturers conduct in-use vehicle testing at their own or at contracted facilities. EPA collects fees from manufacturers to recover the cost of administering our vehicle and engine certification and compliance programs, including in-use vehicle surveillance testing. These fees are submitted to the US Treasury and the US Congress in turn allocates funds to EPA for the Agency to implement its programs. EPA uses a variety of factors to select vehicles for testing. We monitor trends within the industry and emphasize testing of vehicles employing technology that is new to the market. We also rely on defect and warranty reports, customer complaints, and previously identified engineering concerns to inform our testing priorities and choices. Manufacturers conduct and pay for their testing. Selection criteria for the manufacturer program are spelled out in regulation. Generally, the emission control technologies in use today are highly effective. EPA regulations are designed to be performance standards and as such are technology neutral. Since the introduction of the Tier 2 program beginning in 2004, EPA has had the same emissions standards for both diesel and gasoline powered passenger vehicles.
5.	In the aftermath of the VW revelations, other European manufacturers - BMW, Renault, Daimler, Opel, Fiat etc. - have been accused and come under suspicion of changing the performance of vehicle emission control system during the real-world operation (e.g. thermo windows). Manufacturers' responses have made it clear that they are relying at least to some

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	degree on the provisions in the EU regulation and their alleged ambiguities as regards the definition of "normal vehicle operation and use" that they are obliged to adhere to. Given that you use the same reference in the US legislation on defeat devices could you please tell us whether these "normal conditions" are defined in the US law? Have there been ever problems with interpretation of those? How would you assess the legality of those thermal windows? What is the regulatory approach in the US to implement and enforce ban on defeat devices?
	EPA interprets "normal operation and use" as the range of speeds, grades, temperatures, etc. that a vehicle could reasonably be expected to encounter in typical operation. EPA adopted a 5-cycle test procedure for light duty vehicles in the late 1990s that reflects most of those conditions. The procedure includes a cold temperature cycle, a high temperature/high heat load/air conditioning cycle, a high speed and aggressive drive cycle, a city cycle, and a highway cycle. During the 1990s, EPA brought a number of civil enforcement cases concerning defeat devices against light-duty vehicle manufacturers (GM and Ford) and heavy-duty commercial engine makers (Caterpillar, Cummins, Detroit Diesel, Mack, Navistar, Renault and Volvo) based on vehicle or engine designs that failed to maintain emissions control in-use--. EPA subsequently created new test procedures for both light and heavy duty vehicles to ensure that the benefits of U.S. emission standards were realized in use. EPA also increased its review of auxiliary emission control devices submissions from heavy-duty engine manufacturers to review for potential defeat devices. When the consent decrees (settlement agreements) for the GM, Ford, and heavy-duty defeat device cases were put in place in 1995, 1998, and 1999 respectively, they represented the largest Clean Air Act settlements and penalties in EPA history with a total cost to the industry in excess of a billion dollars. As such, EPA's enforcement actions provided a strong deterrent making it less likely the impacted manufacturers would consider such approaches in the future. In fact, many of the manufacturers put in place internal processes to monitor their software development for potential defeat devices.
6.	How do you evaluate/assess the new EU legislative proposals for type approval and emission measurement system, based on your experience with the US system? What is your explanation of why US and not European authorities uncovered the VW's deception? Can you imagine deeper cooperation on the basis of the UNECE 1998 Agreement with the view of harmonised type-approval, emission measuring and emission test-cycles for both the EU and the US?
	Although we understand the question, we are not experts on the EU legislative proposals nor have we carefully analysed them. The defeat device strategies employed by Volkswagen were sophisticated and designed to circumvent the checks that EPA had put in place. The deception itself was uncovered in the US, in part, because EPA and the California Air Resources Board would not accept arguments from VW that in-use emissions simply should be higher. It is our expectation that in-use emissions reflect the EPA's emissions standards, which apply for the vehicle's full useful life. When they do not we investigate to understand why. In the end, VW had to admit the reason why. The technical discussions held as part of the 1998 Agreement process can and do serve as an appropriate area for collaboration and better understanding of emissions measurement and

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	test cycle development.
7.	In relation to the findings on use of a defeat device in the VW case, the following aspects seem to be playing important role as regards the regulatory framework in the US and EU. Firstly, whereas the definition per se of a defeat device (auxiliary emission control device - AECD) in US regulation is actually quite similar to that in EU regulation, the UK Report on Vehicle Emission Testing Programme (April 2016)[1] pointed to the fact the latter does not set in detail how the exemptions to the prohibition on defeat devices should apply, whether or how manufacturers should apply these exemptions or how a type approval authority should evaluate the validity of their use. Contrary to obligations for manufacturers in the EU, manufacturers in the US are required to declare all AECDs at the time of their application for a certificate of conformity by listing them, stating what they sense and providing a justification and rationale for why each one is not a defeat device. It seems that a similar comment was made by former EPA Director Ms Margo Oge during an event organized by environmental lobby group Transport & Environment on 9 June 2016 in Brussels. Unless this concrete amendment is applied to the future EU type-approval regulation together with real compliance enforcement (real driving tests) and in-use verification based on random sample of vehicles, no actual progress can be expected here. Would you support this interpretation, or do you see other important reasons?
	We agree that clear regulations like the defeat device prohibition must also include effective compliance tools including transparent disclosure by manufacturers and enforcement oversight by regulatory authorities. Our experience in the US, including with AECDs and defeat devices, has been that our ability to achieve the emission reductions promised by our regulations is possible because of the very broad authority granted to EPA and the very strong compliance and enforcement provisions set forth in the Clean Air Act. In addition our technical and engineering staff are highly trained in the field and are able to understand manufacturer's technical submittals and respond to issues as they arise.
8.	The current situation in the EU with the type-approval process and the EURO 5/6 Regulation is often quoted as also being a result of regulatory failure, absence of own EC's expertise and the exclusive access of car manufacturer's interests in the EU policy making process. Could you possibly provide us with more information on the details of the process developing the CO2 regulation in the US as regards the categories and nature of expertise involved in its justification in impact assessment process, namely by providing more details about actual involvement of own EPA capacities and funds as well as involvement of which stakeholders and organizations, their role and the nature of inputs their provided to the regulatory process?
	An essential and critical aspect of EPA's role in developing US emissions standards, including

[1] [HYPERLINK "https://www.gov.uk/government/publications/vehicle-emissions-testing-programme-conclusions"]

No	Question
	the recent CO2 regulations, is the depth of its technical resources and commitment to a broad and transparent rulemaking process. EPA has the capacity, the laboratory, and the expertise to undertake rigorous technical, modeling, and economic assessments that provide comprehensive backing for the Agency's policy decisions. Recent examples of EPA's work to inform regulatory development range from conducting demonstration projects to conducting independent cost and mass reduction studies and creating and using vehicle simulation models. EPA engages in an extensive and very transparent regulatory process to develop new regulations. A record of meetings with manufacturers and environmental advocates are documented in memorandum to the public docket where data and other submissions are stored for public review. EPA proactively and intensively seeks stakeholder input and interaction into the regulatory development process, for example most recently by including visits to European automaker and supplier research and development facilities.
9.	According to the Volkswagen/Audi Diesel Emissions Settlement Program (pending Court approval) involving 2.0-liter Volkswagen and Audi vehicles, the owners and lessees can choose either buyback of their car (or early lease termination) with cash or modification to the car to improve emissions and cash. The modification must be approved by EPA and CARB. Has Volkswagen already introduced the modification measures it plans for the 2.0 litre cars? How do you plan to approve the modifications? Car by car or how?
	The settlement will not become endorsed by the Court, and therefore effective, until at least October 18, 2016 so neither EPA nor VW can finalize plans for the emissions modifications until after that date. VW has submitted an initial proposal for some of the 2.0L vehicles and will be providing vehicles to EPA and CARB for testing. VW has not yet submitted a proposal for the remaining 2.0L vehicles but is expected to so. EPA will review and test VW's submissions, and if the results satisfy the details of the settlement, will approve a proposed emissions modification for each of the three generations of 2.0L vehicles. Details about how VW must demonstrate modification effectiveness and durability, and how EPA and CARB will review and test the submissions are spelled out in Appendix B of the proposed settlement. Information and documents relating to the settlement are available at [HYPERLINK "https://www.epa.gov/enforcement/volkswagen-clean-air-act-partial-settlement"]
10.	What has been the nature of the contacts and information exchanges between the EPA and European scientists/engineers/EC officials (including JRC) or Member States representatives with regards to the problems of diesel vehicles emission discrepancies between level on the road and during laboratory testing? Did JRC and EPA have any form of cooperation regarding testing of vehicles emissions, and did EPA ever inform the JRC about the problems of diesel vehicles emission discrepancies between road and laboratory, and the use of defeat devices? Was the problem of the use of defeat devices that reduce the effectiveness of after-treatment technology and the need to develop testing and regulatory practices that would ensure they are not in use, ever discussed between the US and EU?

Commented [CJ1]: Tried to apply Chris' comments but ASD really needs to look at this response.

No	Question
	--consider adding 'it has been well known for many years that the European test cycle (NEDC) is inadequate, and stakeholders have been working on a revised test cycle since (date). EPA has contributed its expertise and learning from the development of the US 5 cycle test cycle. [Karl—pls check for accuracy and relevance—is the WHDC for both criteria and C02? ; has WP29 been doing the RDE?] From EPA's perspective the issue of increased emissions from in-use diesel vehicles in Europe has been known for many years. However, during EPA's investigation of Volkswagen, all vehicle testing and information exchange between EPA and VW was confidential. Thus, EPA did not share any of that information. Moving forward EPA and the EC, including JRC, and other countries have established an informal network of transportation environmental compliance officials aimed at collaborating and sharing information about these issues in the future.
11.	After the VW scandal, it emerged quite clearly that in the EU carmakers sell vehicles, which even when not directly cheating emission testing, do respect emissions standards only when tested in the laboratory by type approving 'golden cars' under testing conditions not representing the reality. How could you ensure that the same is not happening to diesel vehicles approved for the US market?
	EPA uses a flexible mix of testing and other kinds of checks to monitor emissions compliance throughout product lifecycle. As stated previously, EPA is conducting additional testing to check emissions both on and off cycle as part of its evaluation of pre-production models prior to certification. In addition, EPA has the authority to request and test already-certified vehicles from manufacturer production lines and from the public. EPA uses various testing methods that complement one another. Laboratory testing using standard test cycles provides reliability, comparability, and control (EPA's test cycles are designed to reflect actual operating conditions). Laboratory testing using non-standard test cycles and other strategies provide checks against cheating. Testing using portable measurement systems allows over-the-road measurement under real-world operating conditions. Finally, EPA conducts lab audits through which it visits manufacturer and contract laboratories to check testing and analytical protocols, and does round-robin testing to compare emissions results. To prevent the creation of "golden cars" EPA regulations require the vehicles that manufacturers submit for pre-production testing to be representative of (and in fact representative of the worst case, emissions-wise) of the vehicles the manufacturer will produce. That means the vehicle must exhibit all the technical and design features that will be present on vehicles sold to customers. Manufacturers, similarly, may not alter vehicles used for coastdown testing in ways that render them unlike vehicles customers will ultimately drive. Furthermore, EPA tests in-use production vehicles recruited from vehicle owners and requires manufacturers to do the same.
12.	Did the EPA survey the emission values of diesel vehicles without any respect to the country of origin of the examined automobile manufacturers? In other words, besides the cars of VW have there been any tests on vehicles from, for instance, Ford or GM or at least any comparisons of the values between these brands? Finally, is there the possibility to get access to the data material of these tests as it is common in case of international scientific studies?

Commented [CJ2]: Jim/Karl, can you please address this comment from Chris?

No	Question
	Yes. EPA tests all manufacturers' vehicles, and has undertaken a special test program for any diesel vehicle a manufacturer wishes to sell in the US, regardless of the manufacturer's country of origin. As described in the answer to Question 1, EPA has adopted new, unpredictable test procedures that may be applied during compliance assessments at any lifecycle stage (pre-production, production, or in-use). All vehicles (including gasoline models) that undergo compliance testing are subject to the additional evaluation. The initial screening program EPA announced following EPA's Notice of Violation to VW for its 2.0L diesel vehicles covered all light-duty diesel vehicles on the market in the U.S. or pending EPA certification at that time. Since then, EPA has certified light-duty diesel models produced by General Motors, Jaguar-Land Rover, and BMW. The emissions data from certification tests are public and are available on EPA's web site. EPA is not releasing details about its screening program, including data, so as to maintain the unpredictable nature of the testing. However, EPA encourages and will participate in a broader discussion about data sharing and collaboration.

ATTACHMENT 1

- In-use testing looks for a number of possible emissions problems
  - Durability concerns, poor designs, defective parts, production/assembly issues, defeat devices, tampering
- Remote sensing and Inspection/Maintenance program data
  - Real-world emissions data from various state and other programs
  - Considerable amounts of data (thousands to millions of records)
  - Use to target compliance follow up
- Manufacturer In-Use Verification Program (IUVP)
  - Manufactures are required to test annually one and four year old vehicles from the general public
  - Dyno testing – FTP, US06, Highway, Evaporative emissions
  - Typically around 2,000 emissions tests
- EPA In-Use Surveillance Program
  - We test approximately 150 in-use vehicles annually at NVFEL
  - Focus on problems from IUVP, remote sensing data, warranty, defect reports, public complaints
  - Dyno testing – FTP, Highway, US06, SC03, Cold FTP, Evaporative emissions
  - On-road testing

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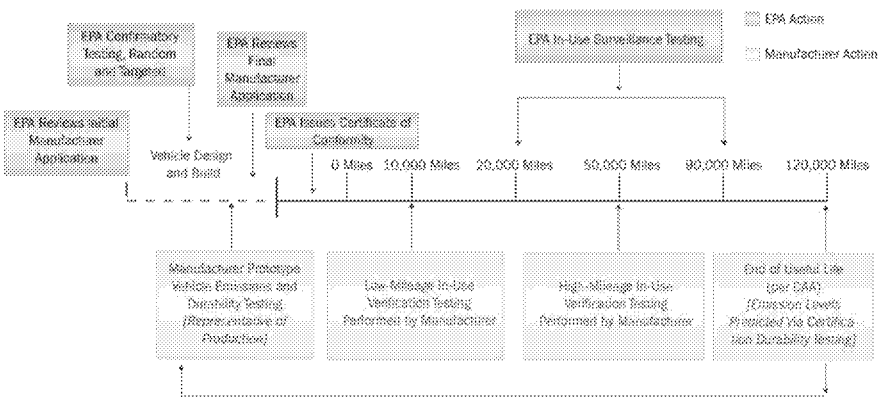
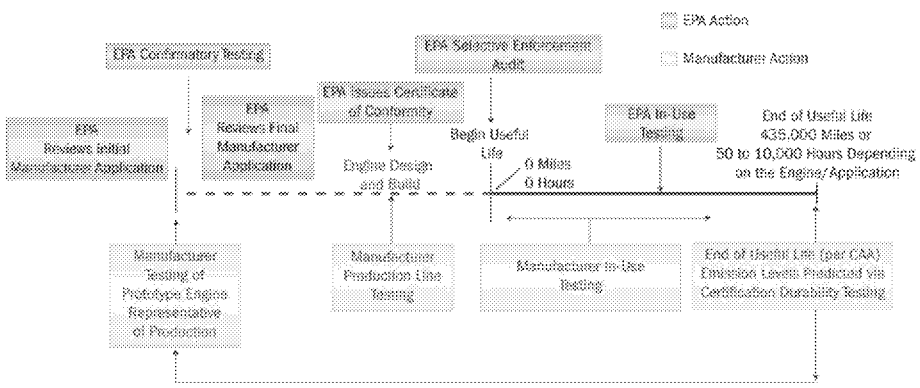
ATTACHMENT 1, continued

EPA's mobile source compliance processes seek to ensure that the vehicles and engines are fully compliant with emissions standards throughout their full useful life. This is accomplished with a variety of testing programs and other requirements that occur over the life of vehicles and engines. This figure shows example compliance schedules for certain sectors. Other mobile source sectors may differ with regard to the timing but generally follow similar protocols.

Compliance Schedule for Light-Duty Vehicles



Compliance Schedule for Certain Heavy-Duty Highway and Nonroad Engines