

## EMIS hearing of 20 June 2016

### Questions to ADAC

No.	Question
1	<p>As ADAC members, many car drivers rely on your evaluations and independent opinion. When was the first time that you found out about the manipulation of the emission values by Volkswagen? When was the first time you reported this? Since when do you know that emission values of other car manufacturers were also manipulated and when did you report this for the first time? In the future, how will you ensure that your members are informed objectively?</p>
	<p>ADAC was never able to prove manipulation by VW. Even after the publication of information from the US, it was impossible to detect manipulation on the basis of the emission metrics available from the NEDC, WLTC 2.0 and motorway cycles.</p> <p>It is not possible to detect manipulation of the control units during our emission tests. This would involve a detailed analysis of the software. However, since we have no access to the manufacturers' protocols and programming languages, this would be extremely complicated, take weeks or even months, and require enormous technical efforts. At any rate, this task falls to those responsible for the defeat software since they already have the required information.</p> <p>Not even the ICCT, whose data led to VW's manipulation being discovered in the US, ever analysed the software. As it were, VW admitted to the manipulation charge after repeated queries from the authorities.</p> <p>ADAC has been conducting emissions and fuel consumption tests of up to 150 passenger cars per year within the framework of its EcoTest since 2003. The consolidated results of these tests are summarised and published on our open-access websites at <a href="http://www.adac.de/ecotest">www.adac.de/ecotest</a> and <a href="http://www.ecotest.eu">www.ecotest.eu</a>, as well as in the ADAC club magazine ADAC Motorwelt. Furthermore, ADAC has regularly published results from studies such as "NOx Emissions from Diesels" (cf. <a href="https://presse.adac.de/meldungen/technik/adac-ecotest-informiert-ueber-die-stickoxidemissionen-von-dieselmodellen.html">https://presse.adac.de/meldungen/technik/adac-ecotest-informiert-ueber-die-stickoxidemissionen-von-dieselmodellen.html</a>) or "PM Emissions from Petrol Vehicles" and has made recommendations to the decision-makers on the basis of these findings (refer to the enclosed position papers). ADAC cooperates with German governmental organisations at the federal and state levels, conducting tests (metrics) and evaluations (ratings) and making our expertise available. Such organisations include the Federal Highway Research Institute (BAST), the German Federal Environment Agency (UBA, in the field of in-use compliance), the Baden-Württemberg Agency for the Environment, Testing and Environmental Protection (LUBW) and the UBA in the field of RDE metrics and test lab metrics (cf. <a href="http://www.lubw.baden-wuerttemberg.de/servlet/is/23231/">http://www.lubw.baden-wuerttemberg.de/servlet/is/23231/</a>).</p>

	<p>ADAC emissions activities have been concentrating on EU emissions legislation out of Brussels for a number of years. At the EU level, ADAC has provided expertise, metrics and results from the ADAC EcoTest and further tests via the FIA.</p> <p>Further, the results of the ADAC EcoTest have been made available to the ICCT, the Institute for Energy and Environmental Research (IFEU), Heidelberg, and other institutions for their analyses.</p> <p>Since the inception of the EcoTest, ADAC has pursued a strategy of maximum transparency for the public based on our own metrics, expertise, objectivity and neutrality.</p> <p>ADAC will refine EcoTest requirements in the future, obtain its own RDE metrics and publish and comment the findings on a regular basis.</p>
2	<p>ADAC tested several VW diesel-fuelled vehicles in the past. Did you ever find any kind of indication that there might have been illegal defeat devices in use? If yes, did you inform the authorities or any other institutions about these suspicions?? If not, would the European and national market surveillance authorities in your opinion have been be able to prove the use of those defeat devices with the available test methods at the time?</p>
	<p>On the basis of its metrics, ADAC has never identified any illegal defeat devices. However, since the introduction of Euro 6, the limitations of exhaust gas aftertreatment have rapidly become evident. For instance, engine-integrated control measures such as Mazda's Skyactiv technology have shown shortcomings in long-term RDE control that were not obvious in the NEDC test cycle. Likewise did BMW's LNT trap catalytic converters as well as the 1<sup>st</sup> generation SCR technology (Passat CC). These results and the weaknesses enumerated were confirmed and published in collaboration with TÜV NORD, the LUBW and the UBA (cf. <a href="http://www.lubw.baden-wuerttemberg.de/servlet/is/23231/">http://www.lubw.baden-wuerttemberg.de/servlet/is/23231/</a>). The results merely confirmed the fact that all relevant decision-makers knew about higher diesel car emissions outside the mandatory test cycles. They also confirmed available findings from other studies (Handbook Emission Factors for Road Transport HBEFA).</p> <p>None of the tests revealed the presence of an illegal defeat device. It is not possible to detect manipulation of the control units during our emission tests. This would involve a detailed analysis of the software. However, since we have no access to the manufacturers' protocols and programming languages, this would be extremely complicated, take weeks or even months, and require enormous technical efforts. At any rate, this task falls to those responsible for the defeat software since they already have the required information.</p> <p>Not even the ICCT, whose data led to VW's manipulation being discovered in the US, ever analysed the software. As it were, VW admitted to the manipulation charge after repeated queries from the authorities.</p>

3	ADAC test published in 2015 reported NOx emissions levels of vehicles on the EU market under the WLTP laboratory test procedure that exceeded the limits set in Union legislation for normal use by several factors. Given the results, would you think it reasonable to suspect the presence of software defeat devices?
	<p>The specification of defeat devices is subject to legal oversight and strict definitions. What the lawmakers certainly did not intend is to allow higher emissions outside the mandatory test cycles. A clear legal position on defeat devices was established as recently as 16 March 2016 on the basis of an outline authorised by the research service of the German Bundestag (Abschalteinrichtungen in Personenkraftwagen Zur Reichweite des Verbots nach der Verordnung (EG) Nr. 715/2007 – Defeat Devices in Passenger Cars. The Scope of the Ban Under Regulation (EC) No. 715/2007).</p> <p><a href="https://www.bundestag.de/blob/417458/a55f9af383df0cf6862384d0b5b83611/wd-7-031-16-pdf-data.pdf">https://www.bundestag.de/blob/417458/a55f9af383df0cf6862384d0b5b83611/wd-7-031-16-pdf-data.pdf</a>. Since the car manufacturers have adopted a differing legal position, the assessment of high exhaust gas emissions and their attribution to illegal defeat devices is no longer a matter for engineers and technicians but of jurisprudence and the legislators who will have to seek a legislative solution.</p>
4	According to the German Transport Minister, General Motors' Opel division has admitted that its Zafira minivan has engine software that switches off exhaust treatment systems under certain speed and air pressure conditions to protect the engine. Shut-off devices are fundamentally illegal unless it is truly necessary to safeguard the engine. Do you believe that switching off the emission control system is necessary to protect the engine? If so, under which conditions is it justifiable? Which specific emission control technologies does this exemption relate to? What will happen to the engine if the emission control system is not switched off?
	From a technical perspective, disabling exhaust gas aftertreatment or a significant reduction of exhaust gas recirculation is not absolutely necessary to protect the engine. It is the responsibility of jurisprudence and the legislators to assess and attribute higher emissions, since the manufacturers take a different stance. Refer to question 3.

5	<p>In the report on the recent investigations of the German Federal Ministry of Transport and Digital Infrastructure and the German Federal Motor Transport Authority (Bericht der Untersuchungskommission "Volkswagen") several diesel-fuelled vehicles have been tested which had already been tested in the ADAC's ECO-Test. The ADAC and the Federal Motor Transport Authority reached at different conclusions on the same car while using both the NEDC-warm test cycle, for example:</p> <ul style="list-style-type: none"> <li>- Mercedes V 250 Bluetech 2.1l, Euro 6</li> </ul> <p>After completing the ADAC ECO test the vehicle achieved the best possible grade. The Federal Transport Authority, on the other hand, drew a completely different conclusion: The NO<sub>x</sub> values during the NEDC-warm test cycle, which ADAC also applied in its ECO test, were 2,9-times higher than the NO<sub>x</sub>-limit (p. 94 of the report).</p> <ul style="list-style-type: none"> <li>- Chevrolet Cruze 2.0D, Euro 5</li> </ul> <p>According to ADAC's ECO test, the exhaust emissions were on a low level, resulting in the awarding of 4 out of 5 possible stars to the vehicle. The results of the German Federal Transport Authority were different again: The NO<sub>x</sub>-values were three times higher than the allowed NO<sub>x</sub>-limit (p. 74 of the report).</p> <p>How is it possible to achieve different results if the same test cycle was used in both instances?</p>
	<p>Re. Mercedes: The vehicle was tested under the new EcoTest protocol (as from 2012), which does not include the NEDC warm. The cycle was replaced by WLTC 2.0 warm. It is therefore impossible to directly compare ADAC and KBA metrics.</p> <p>Re. Chevrolet: The evaluation of emissions in EcoTest is only based on metrics from the NEDC cold and the motorway cycle. The NEDC warm results are only taken into account for CO<sub>2</sub> emissions and fuel consumption. We are planning to introduce a stricter EcoTest protocol.</p>
6	<p>ADAC has been expected to study the emission of the following car makes and models: Nissan X-Trail 1.6 cDi, Jeep Renegade 2.0, Hyundai i20 1.1, Volvo S60 D4 and V60 Cross Country D3, Ford Focus 1.5 TDCi, BMW 520d, Hyundai Santa Fe 2.0 CRDi. Has ADAC carried out these emission measurements? If yes, what are the results?</p>
	<p>Refer to the enclosed table.</p>

7	<p>ADAC published an article "Haben Dieselmotoren eine Zukunft? Spagat zwischen Effizienz und Emission" stating that 15% increase in efficiency could still be reached in today's engines, making a 70g/km CO<sub>2</sub> limit possible. Could you explain what needs to be done to ensure that the increase in efficiency is achieved? What needs to be done to ensure that CO and NO<sub>x</sub> emission limits are also reached?</p>
	<p>This was not an ADAC article. It was published in the Auto, Motor und Sport magazine. Cf. <a href="http://www.auto-motor-und-sport.de/news/die-zukunft-des-dieselmotors-9981192.html">http://www.auto-motor-und-sport.de/news/die-zukunft-des-dieselmotors-9981192.html</a>.</p> <p>A significant reduction of CO<sub>2</sub> emissions is possible through the general introduction of more efficient diesel engines, better injection technologies and a general recourse to mass optimisation, improved aerodynamics and rolling resistance, further drive-shaft optimisation and additional electric hybrid drives. The relevant technologies are widely available in today's cars, and technological advances will keep coming in the next few years and help cut costs. To reduce exhaust gas emissions to the level of 70g/km CO<sub>2</sub>, further measures are required, specifically regarding hybrid electric drives. Diesel cars can only deliver extremely low CO<sub>2</sub> emissions with the assistance of battery-based electric hybrid drives ( e.g. plug-in). To ensure a fleet average of 70g/km CO<sub>2</sub>, it will also be necessary to further adapt car mass – and size – in the family car segment and to offer genuine e-vehicles.</p> <p>CO and NO<sub>x</sub> emissions from diesel cars are controlled by oxidation catalytic converters, exhaust gas recirculation, SCR catalytic converters and LNT trap catalytic converters. All of these technologies have been state of the art in passenger and utility vehicles for years, if not decades.</p>

8	<p>Do you agree with the industry's claim that PEMS testing is not reliable and needs additional testing? Based on your experience, how accurate and repeatable are emissions measurements through PEMS? Do they need additional testing? What technical limitations do portable emissions measurement systems have on the road? Based on your experience and technology development in the area, would you say that the accuracy of the PEMS within the next 5 years will be high enough to evaluate precisely the on-road emissions? In your opinion, is it necessary to set conformity factors in the new RDE test procedure at all? And if so, are the conformity factors of 2.1 (from 2017 to 2020) and 1.5 (from 2021) justifiable from a technical perspective?</p>
	<p>State-of-the-art PEMS allow reliable metrics of critical NO<sub>x</sub> emissions from diesels. The technology must ensure compliance with emission limits in all modes of operation and that the combination of oxidation catalytic converters, exhaust gas recirculation, SCR catalytic converters and LNT trap catalytic converters works reliably.</p> <p>The problem of manufacturer's emissions and fuel consumption specifications diverging from real-life observations must be solved within the framework of vehicle homologation. To this end, in addition to introducing the WLTP for bench testing, the quick introduction of Real Driving Emissions (RDE) metrics to motor vehicle type approval is a stringent requirement. The RDE method measures emissions in actual traffic, i.e. on the road – and not in an emissions lab. However, a WLTP test in the test lab is a prerequisite of an RDE test in compliance with regulations. Lab testing can therefore not be replaced by RDE testing. The first two packages relating to RDE have already been passed. Upon publication in the Official Journal of the European Union, the first RDE package will enter into force retroactively as of 1 January 2016. It defines the specific basis of RDE metrics using PEMS. In the 2<sup>nd</sup> package, the legislators have defined a conformity factor (CF), i.e. the admissible deviation of real-life emissions from the test bench limits, of 2.1 for the type approval of new vehicles as from September 2017 (September 2019 for new registrations). The CF of 1.5 favoured by ADAC will enter into force as late as January 2020 for the type approval of new vehicles as (January 2021 for new registrations). Speedy passage of the 3<sup>rd</sup> package, which will include a CF for the particle number (PN), and the 4<sup>th</sup> package defining in-use conformity testing should be prioritised. In analogy to NO<sub>x</sub>, ADAC calls for a PN CF of 1.5. Only this can ensure that carmakers equip their vehicles with emissions control technologies effectively lowering pollutant emissions under all operating conditions. The responsibility remains on the side of the authorities and the manufacturers.</p> <p>Lab tests are an absolute requirement when it comes to determining CO<sub>2</sub> emissions. Since every gram of CO<sub>2</sub> counts from a motor vehicle tax perspective, the issue is more than just meeting a maximum limit. A free test on the road will not be precise enough for this purpose. The impact of varying ambient conditions and PEMS system components on the metrics are too significant.</p>

9	<p>In ADAC's position paper dating back to September 2015, it's stated that carmakers should equip the vehicles across all segments with emissions control technologies effectively lowering emissions under all operating conditions and ensuring compliance with the Euro 6 limit of 80 mg/km, also claiming that the technologies required are already available today. According to your experience is it possible for Euro 5 and Euro 6 diesels vehicles to meet emissions limits set up in Regulation 715/2007 in real driving conditions? In your opinion, why are car manufacturers not using these latest available technologies in order to meet the actual standards set by EU regulations? What is your experience with application of these new technologies; in what percentage of the cars tested by ADAC have you seen the use of these emissions reduction technologies?</p>
	<p>ADAC requests are based on technical aspects and expertise. Compliance with mandatory emission limits can be ensured by oxidation catalytic converters, exhaust gas recirculation, SCR catalytic converters and LNT trap catalytic converters. The introduction of the strict Euro 6 emission standard was obviously not enough to motivate the automotive industry to live up to the spirit of the law. The carmakers have willingly accepted the risk of road bans for diesel cars due to emissions permanently exceeding the limits. Currently, only two or three car types can be found here and there whose exhaust gas emissions comply with a 1.5 CF. It is yet impossible to provide any percentages.</p>
10	<p>Who is contracting and financing emissions and fuel tests carried out by ADAC? Are your emissions tests carried out in-house or by a third party? If outsourced, could you elaborate on who carries out the tests? How does ADAC carry out is emissions and fuel use tests? Could you elaborate on the methodologies and how these differ from the methodologies used by car manufacturers and type approval authorities (e.g. the NECD lab tests)?</p>
	<p>All ADAC consumer protection tests are funded from membership fees. The ADAC Technik Zentrum is equipped with its own emissions testing lab. This test lab was nominated by the German type approval authority and is certified to the DIN EN ISO/IEC 17025:2005 and 9001:2008 standards. In addition, the ADAC lab is participating in round-robin tests with several other testing labs. ADAC complies with consumer protection standards with a view to expertise, neutrality and objectivity.</p> <p>Usually, we conduct all tests in-house. In exceptional cases only, e.g. when our own lab is unavailable due to major refitting or construction measures, ADAC will use external labs that must be certified to DIN EN ISO/IEC 17025:2005. We would still use our own drivers.</p> <p>The ADAC EcoTest is comprised of three test cycles (NEDC EcoTest, WLTC 2.0 warm and ADAC motorway warm). The NEDC EcoTest is based on the type approval test cycle but not entirely identical. Please find more information in the enclosed ADAC EcoTest protocol.</p>
11	<p>Are you in contact with similar testing facilities abroad? What are the differences in emission testing compared to Germany?</p>
	<p>We have no direct contacts with testing facilities abroad. We therefore have no information on differences in metrics.</p>