Questions to Deutsche Umwelthilfe e.V.

for the EMIS hearing on 16 June 2016

1. *When did you alert first time the German authorities of the exceedance of NOx emission from diesel vehicles and what was their response? What vehicles have you tested, what are the results and what is in your view the explanation for those exceedances?*

We have published our activities in this field in a chronology on our website. I will only highlight the most important steps here.

In 2007, simultaneously to Frankfurt Motor Show IAA, DUH presented in a press conference in detail for the first time manufacturer´s practice in determination of exhaust emission and consumption data. DUH called on the Federal Ministry of Transport and Federal Motor Transport Authority (KBA) to start control measurements and to correct false values. DUH pointed out in detail test cycle recognition tools and defeat devices. DUH assessed this increasingly common practice as consumer deception.

In 2009, DUH urged the Minister for Transport Tiefensee to ensure an effective periodic inspection including tailpipe exhaust measurements and warned of the dependence of On-board diagnostics (OBD) with reference to an US case with DaimlerChrysler which manipulated the OBD in 1.5 million cars so that it would not react if the catalyst failed. The manufacturer was fined by EPA with a penalty of 94 million USD.

In 2011, we addressed massive manipulation of the test cycle with regard to specific software (defeat devices) mentioning the Passat Euro 6 as an example. The Ministry stated tobe aware ofthis problem, which – as DUH underlines – is an illegal practice. Also in 2011, DUH published results of a BMW 116i (gasoline direct injection) with NOx emission 30 times above the limit value in a cycle slightly changed from NEDC (using ADAC "Autobahn-Cycle"). Again DUH demanded from authorities to carry out tests independently.

In July 2011, we published test results from BMW 116i (gasoline direct injection) with NOx emission exceeding the limit value by factor 30 in a laboratory test. We stated that the problem of high NOx emission outside the official test cycle was known for years and referred to comparable findings by ADAC. Again we asked the ministry to commission own tests.

In July 2012, DUH asked the Minister for the Environment, Altmaier, to establish an independent institution from KBA to allow customers to issue complaints against high consumption.

Since 2005 DUH holds monthly expert talks on topics of air quality and emission from road transport where representatives from the Ministries of Transport, of Environment and from Federal Environment Agency UBA are invited and attend regularly. We used the talks to share knowledge and discuss the growing gap between type approval emission values and real world emission with regard to CO2, PM and NOx. On the talk of November 4, 2014 ICCT presented their report on real world NOx emission from Euro 6 diesel cars. Also this meeting was attended by representatives of the relevant authorities. In February 2015, we discussed with Members of the German Parliament from all parties together with the former Secretary for Environmental Protection in California, James Strock. Mr Strock highlighted the practice of investigation exhaust emission including tests outside the official test cycle by US authorities. DUH again pointed on the lack of control in Germany and Europe and requested to install an according mechanism to ensure full compliance with existing regulation.

In summary, all of our attempts have been fruitless. From the beginning, own tests (the BMW) as well as publication by ADAC and the German Federal Environmental Agency provided knowledge about higher fuel consumption (and thus higher CO2 emission) and higher NOx emission (documented in high emission factors as basis for air quality modelling) provided sufficient inducement to release further investigation by competent authorities.

Since September 2015 we have tested several models under laboratory conditions and on the road. All results together with the according press releases are published on our website http://www.duh.de/dieselgate_presse.html. (I apologize for only some of the documents being available in English).

The tests in the laboratory showed high NOx emission in different situations – driving the NEDC cycle with a warm engine, changes in the preconditioning of the vehicle, tests with 4 wheels being moved instead of 2 and other. We could not find a technical explanation for the results and thus urged the Ministry of Transport to commission additional tests. In the meantime manufacturers confirmed to use defeat devices that massively influence exhaust reduction. This might also be an explanation for the findings in our tests.

> *2. In the hearing of the ENVI Committee of 23 February 2016 on real driving emissions tests you indicated that most car manufacturers use defeat devices to meet the legal NOx limits and that DUH made this information public as early as in 2011. Can you point out, how did you discovered the use of defeat devices, what tests you used and how specific and concrete your findings were? Whom did you inform about your findings and when? What were the reactions? If there were no reactions, what in your view were the main reasons for non-reaction?*

On February 10, 2011, we presented information to the German Ministry of Transport about high NOx emission of a VW Passat Euro 6 (EA 189) in a meeting with the responsible Head of the Directorate, Dirk Inger and members of his staff. DUH in this meeting pointed to the manipulation of the test cycle explicitly with software recognizing the cycle. The problem was known to the ministry, we were told. We told the ministry that only the allocation of CPU data of the cycle to the type approval authority together with control of the existing fleet could help to avoid this practice. We clearly stated that this practice was illegal. The ministry however referred to the new test cycle (under development by that time) that would ensure more realistic results. While we published our

minutes of this meeting, there was no notation to be found in the ministry according to a public request by the German Parliament. Our information was detailed and based on knowledge we received from informal sources. We asked the ministry to induce own investigation.

3. DUH has also claimed that already in 2011 the DUH confronted the German government with evidence and detailed measurements of highly elevated NOx emissions of a VW Passat. What was the reply of the government?

We informed the Ministry of Transport in a meeting with the responsible Head of the Directorate, Dirk Inger and members of his staff on February 10, 2011 in detail on the basis of information received by a third party. The reply was that the problem in general was known and that the ministry expects to get more realistic results from a new test cycle which was under development by that time. According to the response on a formal request by German Parliament, no formal notes were taken from this meeting by the ministry. To our knowledge, no further investigation by responsible authorities took place although, as described above, DUH repeatedly addressed the topic in media work and expert talk that representatives of the ministries of transport and of environment did join.

4. DUH has been granted the universal right of legal action according to German law. It allows your association to take legal action when consumer rights or environmental issues might be violated. On page 36/37 of the 2015 annual report you state that 28% of your revenues (i.e. 2,323,000 Euros) come from consumer protection. Can we assume that these revenues largely stem from giving written warnings to car dealers (and others) who allegedly did not comply with energy labelling regulations? How often did you use this right to take legal action in the last five years and against whom? How much money was received through fines?

DUH is an independent organization for environmental and consumer protection. We are entitled to sue. We use this right in order to ensure full compliance with existing EU and national legislation on environmental and consumer protection, namely on the requirements of energy consumption labels, of information on the content of harmful substances in specific products (like mercury in energy saving lamps) or hazardous emission from handheld machinery. We are in close contact and collaborate with the authorities responsible for market surveillance. Market surveillance is a core duty of public authority. However, we often find this duty not being fulfilled in a way that could ensure comprehensive compliance with existing legislation. As an example for our work, we want to explain this with the energy consumption label for household appliances. The information has to be made available to the customer to allow him a well informed decision concerning the energy consumption of the product. In the past, we found this important information not being presented as the regulation requires resp. companies misleading consumer by providing wrong information. We control retailer and industry and urge them to fulfil the requirements. In case they would deny to fulfilling the requirements defined under European legislation we are able to take legal action. The number of failures has declined in the past: While in 2009 more than 85 % percent of the cases we looked at did not comply with the existing legal requirements, this number went down to 1.7 in 2014.

DUH randomly controls compliance in about 30 fields of law (energy and efficiency labels , exhaust emission from handheld machinery, passenger cars, construction machinery, mercury content of energy saving lamps, correct labelling of refillable vs. one-way bottles and cans etc.). Each year, from the identified infringements roughly 1.500 cases are randomly selected and persecuted. About 75% of the cases find settlement out of court, 350 to 400 cases are decided by the court. The rate of lost cases is about 3-4%. The income out of the market control in the past years amounted to 2-2.5 Mio €. It financed market control activities and the related investigation, analysis and consumer advice.

5. On page 36/37 of your 2015 annual report you also present a breakdown of how your NGO is financed and how much money was generated. Who exactly supported you and can you provide us with a list of your biggest contributors? Can we assume that you receive financial support by manufactures of diesel particle filters (as in the past) or by other manufactures that could profit economically from the "Dieselgate" scandal? If this is no longer the case, could you please name the companies (or at least the sector) that support your association? You further state in your annual report that you receive financial support by the EU and the federal government of Germany. What projects have been financed in the last five years and how much money did you receive from public sources?

DUH aims at providing better knowledge and awareness of ecological comprehension, consumer protection and consumer advice, at engaging for environment protection namely with regard to clean air and water, reduction of noise, at supporting circular economy and other NGOs that work in the field of nature protection with financial means. We receive support from manufacturers and industry if our goals in specific aspects are overlapping – one example is the comprehensive reduction of particle emission from diesel engines. However, DUH is an independent NGO and no agency. We are independent to fulfil our statute and do not follow any company´s sale strategy. The sectors of companies that support us range from telecommunication ("Telekom" is our biggest supporter), several hundred companies in beverage trade, beer production ("Krombacher" as one example), mineral water plants, organic food companies. In the field of air quality we get some small support by exhaust control technology (HJS and other producers of diesel particulate filters) and for CO2 reduction from Toyota as one example.
Since September 2015, we intensified our emission testing (LINK ZUR WEBSEITE EINFÜGEN). In March 2016, we launched the "Emission Control Institute". For all of our laboratory and RDE testing we spent by today about 500.000 € fully funded by US, European and German foundations and private donations. Up to now we did not receive funding for these activities from industry.
DUH received and does receive funding from the European Union for several projects under the LIFE program – to inform about efficient and climate friendly mobile air conditioning, to support legal action in case of exceeding ambient air quality standards in several European countries and to address particle emission from wood burning devices. We received money from national ministries to encourage the dialogue on national and regional level on the extension of the electrical grid system, which is necessary to realize the transition towards renewable energy in Germany, to address high nitrogen emission from the agriculture and food sector and other projects. The amount of funding changes every year according to the projects that we manage to successfully apply for.

ED_002078G_00012631-00004

6. Published findings of DUH are mainly based on cars from German car producers. How do you decide on the focus of your examination? How, where and under which conditions do you conduct your emission testing?

Please allow me to adjust this impression. Our laboratory tests in Biel (Switzerland), commissioned since autumn 2015, started with Opel Zafira using GM Powertrain engine. The next car was a Renault Espace Diesel. We tested Mercedes and then Fiat/Chrysler and finally a Smart. The tested models represent German, French and Italian companies as well as US and Japanese (Nissan) manufacturers. Since March 2016 we started an RDE program within the Emission Control Institute on the TOP 30 diesel cars sold in Germany.

We are not focused on a specific manufacturer or a specific geographic region. We chose cars in accordance with their presence on the German Market in order to ensure a broad relevance of our findings and to support the interests of a wider share of car owners. We also select cars if we get information on specific performance irregularities.

Tests in the laboratory commissioned by DUH were carried out by the Laboratory for IC-Engines and Exhaust Emission Control (AFHB) of the Bern University for Applied Science in Biel, Switzerland. AFHB is accredited as an official test institution for the Swiss government. Additional measurements have been done by the Faculty of mechanical engineering of Czech Technical University in Prague. All tests in the laboratory are documented on our website including a detailed description of the test cycles and the results. The cycles include the official NEDC cycle as it is used for the type approval procedure as well as additional cycles.

PEMS tests are carried out by DUH staff members under the technical surveillance of Dr Axel Friedrich. Dr Friedrich has many years of testing experience and excellent technical knowledge. Before his retirement, he headed the department for transport and noise in the German Federal Environment Agency, UBA. All results are resp. will be documented in detail and published on our website. We provide the relevant authorities (in Germany the Ministry of Transport and certification authority KBA) with full data and ask them to run additional tests in order to prove our results.

7. The car industry claims that in order to meet the current binding legal NOx limits more time is needed to allow necessary technological development. Could you please explain if according to your knowledge the European car manufacturers could deliver clean cars respecting EU legal NOx limits in real world driving without any necessary adjustments (conformity factors) as introduced in the new RDE test? Are the conformity factors of 2.1 (from 2017 to 2020) and 1.5 (from 2020) justifiable?

The regulation 715/2007 defining the requirements of Euro 6 standard has been published in 2007. As always done in those legislative processes, an impact assessment has been commissioned by the EU Commission in preparation of the regulation in order to ensure technical and economic feasibility of the new standards. Today, we not only see vehicles in the European market fulfilling those standards under real driving conditions (ICCT study by October 2014) but also diesel vehicles that fulfil the US standard on the road which is about twice as ambitious as the European one. Latest examples can be found in the report launched by German "VW Enquiry Committee" and thus the Ministry of Transport BMVI and KBA: BMVI/KBA testing program not only looked at the use of defeat devices among the manufacturers but also pointed to the vehicles with relatively low NOx emissions fulfilling Euro 6 standards, even when tested on the road. More relevant are the tests from US

ED_002078G_00012631-00005

authorities EPA in Washington and CARB in California showing that diesel cars can fulfil much more ambitious standard under US regulation even under RDE testing.

Thus to our knowledge car manufacturers are able to deliver clean cars. Modern exhaust reduction technology provides comprehensive NOx reduction to fulfil Euro 6 standards on the road under normal driving conditions and under all ambient conditions regularly found in the European Union, especially at low ambient temperatures as required in the relevant regulations. The conformity factors as introduced in the new RDE test therefore do not reflect an obvious need to develop new technology but to allow the ongoing use of technology with less efficiency (NOx trap for example) while efficient technology (such as SCR) is on the market but has low penetration levels for economic reasons today.

8. Do you agree with the German, French and UK authorities' conclusions on the legality of the practice of switching off emissions control devices at certain ambient temperatures? You have made analyses of the average functional/dysfunctional times of emission controls technology of diesel vehicles related to ambient temperature conditions: what are the results and the implications for compliance with air quality standards and for consumers? Do the ambient temperatures in Europe have any influence on the functioning of the engine?

We do not agree with the conclusions made by German, French and UK authorities but are convinced that this practice is illegal. Opel – to give only one example – admits that the exhaust devices of the Zafira tested by KBA work properly under ambient temperatures between 20 and 30 degree Celsius. Below 17 degree Celsius and above 33 degree Celsius a defeat device is activated.

As a consequence, the emission reduction system does not work properly at more than 83 % of the time due average ambient temperature outside this area in any German – and probably most of the European regions.

The regulations 715/2007 and 692/2008 clearly define the requirements of exhaust reduction technology in Euro 5 and 6 diesel cars. The devices have to be constructed in a way that ensures full function "in normal use" (Art. 5(1) EG 715/2007), in normal European ambient temperatures and heights and over the whole normal life time of the vehicle (resp. 160.000 km). NOx reduction technology is in a defined frame depending on <u>exhaust temperature</u> (while technology exists to overcome this dependency in order to ensure proper functioning), not outside weather temperature.

In addition, specific requirements are defined for example under (EG) 692/2008 which states in annex XVI that systems using a reagent shall "retain its emission control function during all ambient conditions regularly found in the European Union, especially low ambient temperatures". It clearly defines requirements if the reagent has frozen: "the manufacturer shall ensure that reagent shall be available for use within 20 minutes of the vehicle starting at 258 K (– 15 °C) measured inside the reagent tank, so as to ensure correct operation of the emission control system."

ED_002078G_00012631-00006

9. According to your previous statements, first tests on VW Amarok cars after their recall show no NOx reduction and real world emissions remain at the same level as before, in some cases the consumer are also facing much higher fuel consumption of their vehicle. Could you please explain the reasons for this? Is it because the ECT cannot be technically adjusted or is it because the adjustment has not been done properly?

The model Amarok has been tested by the German automotive journal *Auto Motor Sport* after the vehicles have passed the "according procedure" in the frame of the official recall ordered by German type approval authority KBA. According to the report, NOx emission increased from 1.510mg/km (old software) to 1.530mg/km (new software). Fuel consumption also increased by 0,5l/100 km.

The wording "according procedure" is used here since we have no specific knowledge on the concrete demands and definition of the outcome of the recall. Our formal request to KBA, dated October 2015 and based on German legislation on access to information, was rejected first but the court decided our request was justified. However, KBA and Volkswagen claimed the information as business secret and we received from KBA 581 pages of more or less 100% blacked paper.

We thus have no evidence that the reduction of NOx emission under real driving condition and thus compliance with the standards is part of the mandatory recall. Obviously, an appropriate condition has not been determined. Thus, we do not have any knowledge on the technical requirements for the recall and the specific adjustments for any of the models included in the recall. We also do not know if KBA did testing on the Amarok after the recall and about the outcome. Without any doubt, a reduction of NOx emission to the existing limit value under real driving condition must be the outcome for all models under the official recall to avoid the loss of type approval due to failing existing regulation on exhaust emission standards.

10. According to your knowledge, will the newly designed RDE test deliver clean cars on European streets respecting legal limits for pollutants and clean air in European cities or does it have too many loopholes to be able to deliver (cycle beating and defeat devices not explicitly forbidden, cold start excluded, boundary conditions not representative of a normal driving conditions, etc.)?

It is important to stress the RDE test procedure is still being developed and it is not possible to say how effective or not it will be at this point. However, RDE alone will not help to avoid dirty cars on the street. Only two out of four packages of the RDE test procedures are yet defined under UNECE regulation. And already here we see a lot of misleading. Giving manufacturers the allowance to exceed the limit value by a factor of 2.1 under this testing until 2021 and thus weaken the existing standard set by the European legislator undermines the potential of this instrument and will result in ongoing exceedance of air quality standards in Europe. There are questions open about the integration of cold starts or the other emissions such as particles and CO2 or how to avoid a "golden car". We have learned in the past months about the manifold options to influence emission control technology by various software features. Up to now, some of them were related to the specific conditions of the test cycle in the laboratory. We see first indicators that there are adaptions done for RDE testing.

It is relevant to monitor and expand the boundaries of the RDE test procedure such as temperatures and altitudes. Previous experience has repeatedly shown that driving situations that are not covered by regulations can lead to uncontrolled and very high emission behaviors. This is especially true for

ED_002078G_00012631-00007

NOX emissions which grow exponentially outside of the operating conditions covered by the design of the aftertreatment systems and their control algorithms. To prevent this from happening, the European Commission should define additional, independent tests to monitor the performance of vehicles outside of the boundary conditions of RDE (e.g., ambient temperature, altitude, dynamic driving indicators) and expand the limits as necessary to maintain low in-use emissions (also see: ICCT Position Brief December 2015). A rigorous pan-European testing of vehicles already in use (market surveillance) is also urgently needed.

It is also essential to complete the procedure by random testing (dynamic driving, high and low temperatures, different grades) carried out by independent bodies avoiding "golden cars" and under changing test conditions (like already done in the US: Authorities do not publish their test procedure).

Another essential requirement of future regulation in this context is immediate and full publication of all relevant data such as the road load coefficient as a precondition for independent testing.

11. In the beginning of May, Eurostat figures showed an increase in CO_2 emissions in the EU, transport being responsible for the biggest increase in CO_2 emissions. At the same time, diesel engines consume less fuel than petrol engines. Which transition path or paths towards a carbonless road transport in the EU should be stimulated combining climate, employment and public health goals? Should public policy stimulate the uptake of some middle-sized diesel cars which perform excellent in terms of NOx emissions but consume more than small diesel cars?

Today, average emission of diesel and petrol cars in Europe are more or less on the same range. CO2 emission from petrol cars are only 1.6 g/km higher than diesel cars in the average (Herbert 2013). Diesel cars tend to be heavier and equipped with higher motorization than petrol cars and thus lose the efficiency advantage of the fuel itself. Japanese car industry was forced to invest in new gasoline technology 20 years ago due to stringent NOx regulation and reduction of tax advantages for diesel as a major driver for urban air pollution in the region. We now see CO2 emission of the Japanese fleet about 16% lower (108g/m in the average fleet with 1.8% diesel share and 22% petrol hybrid cars) than EU average (128g/km with 53% diesel share and 1.4 petrol hybrid cars) (JAMA 2015, Cames and Helmers 2013, EEA 2014). The data refers to NEDC testing for Europe where the gap between official (NEDC) data and real world consumption reached a gap of 40% in average.

Low carbon technology is available. It has been blocked by wrong incentives like tax advantages for diesel fuels and weaker NOx standards for diesel cars compared to petrol engines. The three national investigations into the VW scandal now finalized by Germany, France and UK clearly show that there is no difference in terms of NOx emission exceedances between different diesel segments – SUVs, middle-sized diesel and small ones often have high NOx emissions exceeding many times the allowed standard.

Additional climate effects of diesel engines are not included in the balance by now. Diesel engines emit black carbon, which is the second most important human emission in terms of its climate-forcing in the present day atmosphere (according to NASA 2013). In addition, the negative impact of diesel emission on human health has to be reflected as diesel emission cause cancer (according to

ED_002078G_00012631-00008

WHO 2012). Higher diesel requests lead to inefficient fuel production and –transport (FÖS, IKEM 2015).

Diesel technology is complex and thus cost intensive. The advantage given to diesel by lower taxation on the national level and the allowance of higher NOx emission compared to petrol does not reflect external costs caused by diesel emission. Public policy should be technology neutral based on requirements like low carbon intensity and effective exhaust reduction – be it for middle-class cars or small ones. The assessment should be based on the result of transparent research and the proof of on road measurements.

12. *What do you consider as the key priorities in terms of solutions for the future?*

Key priorities are independent testing from cars at type approval and for vehicles from the existing fleet (market surveillance) together with immediate publication of relevant data. The test must include all pollutants (PM, NOx, CO2). The tests must be commissioned by an authority different from the type approval authority. The tests shall be financed by a registration fee for first registration. EU authorities should supervise national type approval authorities and test institutes.

It is also necessary to introduce effective sanctions in case of non-compliance including withdrawal of the type approval and financial compensation for the customers.

In order to find a solid solution for the future it is also necessary to accept that a solution for the present situation has to be effective. This solution must ensure that vehicles exceeding the current limit values on the road either face a mandatory recall to ensure compliance or lose their type approval. If they can't meet the standards on the road they must be removed; high NOx emissions are not a victimless occurence.

13. *According to several experts from both public and private bodies, we can reasonably state that all institutional bodies at European and national level knew since long time about the discrepancies between type approval emissions and the ones in real driving condition. Is in your opinion and in the light of existing technologies, the delay in presenting the proposal for changing NEDC procedure justifiable? In 2005 it was already clear that Artemis method was much more accurate than NEDC for the estimation of emissions in real driving conditions. What in your opinion could be the reason why NEDC was chosen instead? Do you think that if Artemis method was adopted, the gap between real emissions and type approval could have been reduced? Do you agree that technologies are already available on the market at reasonable price that can ensure the respects of emissions limits for Euro6 vehicles in real driving conditions? Is in your opinion, the introduction of the conformity factors of 2,1 up to 2020 and of 1,6 from 2020 onward for Euro6 RDE testing technically justifiable?*

Exceedances of CO2 and fuel consumption are caused both by unrealistic test cycles on the one hand and an increasing exploitation of loopholes which includes defeat devices used under this test cycles as well. Loopholes exploited under the coast down test (to define the road load of a vehicle as relevant information for the laboratory tests) alone cause about 30% of discrepancy of CO2 emission according to ICCT. In addition, specific features of the vehicles are being optimized for the NEDC

ED_002078G_00012631-00009

procedure. Other test cycles might look more realistic in terms of speed and acceleration and thus might decrease the gap between official data and real world consumption but do not seem to be resistant against manipulation and exploiting in a way we see under current procedure. Recent investigation showed that exceedance of exhaust emission is the result of applying a wide range of defeat devices by a broad range of manufacturers that influence the exhaust cleaning systems in a negative way outside the test cycle. Those applications, to my opinion, might be adapted to new test cycles as well.

It thus turns out to be more a question of implementation of existing legislation that clearly requires compliance under normal use of the vehicles. Discrepancies have been known to the relevant bodies on EU and on national level but no action to explore the reason or to close the gap has been taken.

As already mentioned there are vehicles performing according to legislation under different test procedures and complying with the existing limit values under real world condition not only to meet EU standards but also to meet US standards which are much stricter. There is no need to include any conformity factor in the RDE procedure. On the other hand, high NO2 pollution all over Europe, resulting in several hundred thousand premature deaths each year and a growing number of severe affection call for effective regulation to reduce NOx emission namely from the most relevant source in urban and densely populated areas: diesel passenger cars.

Dorothee Saar for Deutsche Umwelthilfe, Berlin, June 2016

ED_002078G_00012631-00010