EMIS hearing on 19 April 2016

Questionnaire to the International Council on Clean Transportation (ICCT)

Question
1. An ICCT study published in 2014 reported NO_X emissions levels in normal use that exceeded the limits set in Union legislation on average by a factor of 7. Did you share your results about the concerned vehicle models/engines with the relevant national type approval authorities and the European Commission? If yes, which national authorities and Commission DGs were informed? If not, why? This study (Real-world exhaust emissions from modern diesel cars) was published in our website (http://www.theicct.org/real-world-exhaust-emissions-modern-diesel-cars) on October 11, 2014, and has been publicly available there since then. Preliminary results were presented at an RDE-LDV working group meeting on March 31, 2014, in Brussels (https://circabc.europa.eu/d/d/workspace/SpacesStore/669f6fd9-8077-4667-bb95-8bd302a80a44/PEMS%20activities%20ICCT.pdf). Thus, anyone engaged in or following the RDE-LDV discussions would have been well aware of the study and its findings, even before it was publicly released. We did not circulate the study in any special manner otherwise. Some vehicles in the study had to be anonymised to comply with requirements of third-parties who contributed data. This permitted us to maximise the number of vehicles studied. To avoid treating manufacturers unevenly (i.e., naming some while others remained anonymous) we anonymised all the vehicles analysed. We did not notify any national authorities about specific vehicle models because the purpose of the report was to characterise the on-road emissions behaviour of modern diesel cars overall, not to investigate individual models.

Question
2. The ICCT suggests obtaining vehicles at random from private individuals for in-use tests. What do you believe should be the size and the type of the sample in order for the tests to be representative? Have you thought of other options besides private individuals? Random in-use testing coupled with a robust enforcement programme is an essential guarantor that manufacturers are complying with vehicle regulations. Testing 10-20% of new vehicle types can be sufficient, and this can be achieved by testing a few dozen vehicles per year). Obtaining in-use vehicles for testing from randomly selected private individuals or car fleets (e.g., rental car companies) is the best option because the vehicles have been broken-in through real-world use. Sampling from manufacturers' assembly lines or from dealer lots could supplement this approach.
3. Is it possible under the current European legislative and technical framework to detect the existence of a defeat device? Can we expect that due to technical and scientific evolution in this field, there will new detection capabilities available in the short- and medium-term? Detecting a change in engine calibration affecting pollutant emissions during operation that could signal the presence of a defeat device is possible under the European legal and technical framework. However, it may be a less than straightforward question whether or not that calibration change is a legal by virtue of an exemption from the prohibition on defeat devices. This is because of ambiguities within the framework concerning how exemptions from the defeat device prohibition are administered and in the definition of emission control systems. Defeat devices can be detected with currently available instruments and testing methods, regardless of the direction of technical and scientific evolution. As a result of the ongoing revelations concerning excessive NO_X emissions from diesel vehicles, it is likely that more resources will be devoted to defeat device screening. Greater availability of technical resources (both laboratory equipment and expertise) should increase the capacity to screen for and detect defeat devices.

Question
4. Can you explain why NO_X abatement functions are so vulnerable to manipulation by software defeat devices? NO_X control systems are 'active', meaning that they must be intelligently managed by software in the vehicle's electronic control unit based on a series of input parameters. But managing those NO_X control systems in such a way as to circumvent a vehicle emissions test is functionally no different than managing them in order to minimise NO_X emissions at all conditions. So, for example, the software routine that regulates the injection of urea in a selective catalytic reduction system could reduce the frequency under certain conditions (i.e., off the test cycle) in order to conserve urea, which would reduce the frequency with which an owner would need to have the vehicle serviced. The software routine that enriches the air-to-fuel ratio in order to regenerate a lean NO_X trap could be made to do so less frequently in order to obtain better fuel economy or permit the use of a less durable catalyst. And the routine that controls exhaust gas recirculation can vary the percentage of EGR to optimise NO_X control or to improve fuel economy and power.
5. What is your view on Portable Emissions Measurement System (PEMS) testing? Is it reliable and accurate? Does it need additional testing? 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 of NO_X in LDV? In terms of reliability and accuracy, PEMS systems are almost on par with laboratory equipment, and they are less vulnerable to defeat strategies than laboratory tests. They are the preferred tool for gathering real-world, time-resolved emissions data. But PEMS tests are not fully repeatable, because they introduce additional sources of variability (e.g., traffic conditions, driver behaviour, weather) that are minimised during laboratory testing using a predefined cycle. This poses challenges to the use of PEMS in a regulatory context. We think the use of PEMS in the context of market surveillance tests (or type-approval tests with a conformity factor greater than 1, as in the RDE) is appropriate.

Question
6. Are you aware of the reasons of rejection by the European Commission of the ICCT proposal for funding a research project submitted in September 2012 on the exceedance of NO_X emissions by diesel? We submitted our proposal as part of a larger research consortium following a public call for tender ENV.C.3/SER/2012/0040. There was a transparent evaluation process, and a competing consortium led by TNO of the Netherlands was finally awarded the project as a result. The grounds for the Commission's decision to reject our bid were that we failed to represent the best case of value for money in accordance with the award criteria set out in the call for tender. A scan of DG Environment's rejection letter can be found here: https://theicct.egnyte.com/dl/frxpD7QdWX
7. Can you elaborate on why the ICCT proposes that countries with a significant diesel vehicle population, such as EU Member States, should start screening programs immediately? And why does it consider that, in the case of Europe, the Commission could coordinate such testing programs? On the basis of our emissions modelling work, even a small percentage of cars equipped with defeat devices can have a disproportionate effect in overall NO_X emissions of the fleet (and therefore in air quality). A screening programme can ensure that all vehicles are in compliance with the regulations. If the European Commission adopted a coordinating role, it would alleviate the problem of fragmentation of authority–in our opinion, one of the main shortcomings of the current European vehicle type-approval framework–and help optimise the use of available resources. The European Commission is, by definition, an independent authority, and not subject to constraints faced by either commercial or member state run operations. The JRC and its emission measurement laboratories in Ispra could play an instrumental role under this scenario.

Question
8. With regards to your findings, would you consider diesel technology to be effective tool to achieve the key targets of EU climate framework, in particular the reduction of the CO_2 emissions? While diesel vehicles tend to have a lower fuel consumption rate than gasoline vehicles, burning diesel emits more CO_2 emissions per litre of fuel than burning gasoline, which lowers the actual CO_2 emissions benefit. While diesel cars had an efficiency advantage over gasoline cars in the past, in recent years the efficiency of gasoline cars has significantly improved, to a point where the efficiency –and also CO_2– difference between these powertrains is not that large anymore. At the same time, diesel cars require significantly more sophisticated exhaust aftertreatment than gasoline cars, which adds technology costs to the diesel vehicles and reduces the cost/benefit ratio of the diesel powertrain. For the future, we expect that (clean) diesel will likely continue to play a significant role in the market, especially in the larger passenger vehicle segments, and certainly in the heavy-duty sector. But there are several other technologies that could also help achieve the required reductions, in most cases at a better cost/benefit ratio than diesel technology. Our studies show that the efficiency of gasoline powertrains will continue to improve significantly in future years and –in combination with more efficient tyres, aerodynamic improvements and light-weighting– will allow for further CO_2 reductions at low costs. Furthermore, the hybridisation of gasoline powertrains offers the possibility of even greater CO_2 reductions and at the same time will facilitate a transition to full electrification of the vehicle fleet in future years. For the diesel powertrain, a similar transition towards hybridization would be possible in principle but would likely be less attractive from a cost/benefit point of view, as it would require the combination of the inherently more expensive diesel technology and its exhaust aftertreatment measures with an electric motor and batteries.

Question
9. According to the recent studies presented by ICCT's Dr Vicente Franco in a meeting in the European Parliament on 01/03/2016, EURO 6 certified heavy-duty vehicles equipped with selective catalytic reduction technology achieve better results than equally equipped EURO 6 passenger cars. What is the reason for this divergence in your opinion? (We do note that the amount of data behind the emission factor estimates is relatively small for the heavy-duty vehicles, but the limited experimental evidence seems to indicate that the NO_X emissions behaviour of Euro VI trucks is very good, to the point that the average on-road emissions on a grams per kilometre basis are lower that for Euro 6 cars). In-service conformity testing (using portable emission measurement systems, PEMS) has been in place for heavy-duty vehicles in Europe since 2014. As we noted in response to question 2, in-use testing is an essential, proven effective element in any successful regulatory compliance and enforcement strategy. It is not currently required for light-duty vehicles in Europe. Euro VI addresses the Euro V problem of under-emphasizing high NO_X emissions at the low-speed, low-load driving conditions typical of urban areas with test cycles that better represent real-world driving conditions of trucks. Euro VI standards replace the European Transient Cycle (ETC) and Stationary Cycle (ESC) with the World Harmonized Transient Cycle (WHTC) and Steady-State Cycle (WHSC). The WHTC requires both cold and hot start conditions and includes more than twice the idling time as the ETC. Similarly, the WHSC includes an average engine load about half that of the ESC. Euro VI also introduced off-cycle emissions testing requirements that follow the not-to-exceed (NTE) limit. Lastly, although the in-service conformity (ISC) testing requirements, using a Portable Emission Measurement System (PEMS), introduced with Euro VI complement the test-cycle changes in ensuring conformity to NO_X emissions limits, ISC testing has emerged as one of the most important new aspects of the Euro VI regulation. The first in-service conformity test must occur within 18 months of type approval, and the vehicle model must be tested at least once every two years. Testing includes a mix of urban, rural, and highway driving, and tracks emissions of carbon monoxide, total hydrocarbons, CO_2, NO_X for diesel engines and methane for gas engines.

Question
10. Do you believe that the proposed measures you have put forward to strengthen the RDE guarantee technology neutrality? In your opinion, what are the next steps that need to be taken in order to achieve this goal? (We assume this question refers to the policy brief on the RDE regulation that we published in December 2015). The improvements to RDE suggested by ICCT do not address technology neutrality in the usual sense of the term (equal emission limits regardless of technology / fuel used). The current RDE regulation does not address technology neutrality either because it applies a single conformity factor to the Euro 6 emissions limits. The limits differ for gasoline and diesel, ultimately leading to different effective ‘on-road’ emission limits, and specifically a higher NO_X limit for diesel cars. To the extent that gasoline vehicles are generally able to meet Euro 6 emission limits on the road, RDE in practice will favour diesel in spite of a poor performance from the air quality perspective.

Question
11. The ICCT reported in 2014 that diesel-fuelled light-duty vehicles have low on-road emissions of total hydrocarbons and of CO (no details for CO_2 are given), but performed less good on NO_X. What steps need to be taken in order to ensure that CO_2 emissions from passenger cars in the short run don't increase if people turn to cars that run on fuels which produce more CO_2? Our 2014 Euro 6 diesel report did cover on-road CO_2. On-road CO_2 emissions / fuel consumption were found to be on average 43% above the certified value (Figure 14 in the original report). This is consistent with the findings of other ICCT publications focusing on real-world CO_2 / fuel consumption from passenger cars (both diesel and gasoline), particularly the “From laboratory to road” series of reports (the latest report in the series can be found here: http://www.theicct.org/laboratory-road-2015-update). Manufacturers will continue to be required to meet the fleet-average CO_2 targets. In a scenario in which diesel is partially replaced by gasoline, we expect some of the technologies mentioned in the reply to question 8 to play a larger role. On “fuels which produce more CO_2”, we would like to clarify that diesel fuel produces about 12% more CO2 per volume of fuel burnt than gasoline. The main advantage of diesel relates mostly to fuelling costs (due to lower taxation of diesel fuel). According to the data published by the European Environment Agency, the average CO_2 emissions performance of petrol cars (122.6 g CO_2/km) has been catching up with that of diesel cars (119.2 g CO_2/km). The market share of plug-in hybrids and battery electric vehicles continues to increase across the EU, but additional policy support for such inherently low CO_2 emitting vehicles will also be important to meet the EU's long term carbon reduction goals.