

CHANGES TO THE MOTOR VEHICLE TYPE-APPROVAL SYSTEM IN THE EUROPEAN UNION

ICCT POLICY UPDATES

SUMMARIZE

REGULATORY

AND OTHER

DEVELOPMENTS

RELATED TO CLEAN

TRANSPORTATION

WORLDWIDE.

In spring 2018, the political bodies of the European Union (EU) adopted a number of measures designed to improve the procedure for determining emissions of new road vehicles. These measures are part of two distinct pieces of regulation:

- » A new type-approval framework regulation; and
- » an amendment to regulation EU 2017/1151 to introduce the second act of the European WLTP regulation and the fourth package of the Real Driving Emissions (RDE) test procedure. These bring in new elements such as in-service conformity testing with RDE and the introduction of fuel consumption meters for monitoring purposes.

This policy update summarizes the key elements of both new regulations and provides references for further reading for those interested in more details.

NEW TYPE-APPROVAL FRAMEWORK REGULATION

The current framework for the type approval of motor vehicles in Europe was implemented as Directive 2007/46/EC¹ in September 2007. Already before the Dieselgate scandal broke, the European Commission (EC) had begun a review of the arrangement and, in January 2016, put forward a regulatory proposal for an overhaul of the EU type-approval system.² After almost two years of political negotiations, the European Parliament and the European Council (the EU member states) reached an agreement in December 2017.³ In April 2018, the European Parliament approved the agreement, with 547 Members of Parliament voting in favor of the new type-approval

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- 1 Directive 2007/46/EC of the European Parliament and of the Council, establishing a framework for the approval of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles, 5 September 2007. Retrieved from <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02007L0046-20180331>
 - 2 Vicente Franco, *Proposed new type-approval system for motor vehicles in the European Union*, (ICCT: Washington, DC, 2016). Policy update, April 2016. Retrieved from <http://theicct.org/proposed-new-type-approval-framework-eu-policy-update>
 - 3 European Council, Council of the European Union, "Approval and market surveillance for cars," March 2018. Retrieved from <http://www.consilium.europa.eu/en/policies/type-approval-for-cars/>

scheme and 83 against.⁴ Adoption of the Council is still required, but considered a formality, before the new rules will be enforced from 1 September 2020 onwards.

Even though the new type-approval framework constitutes a major revision, it largely maintains the basic architecture of the European type-approval system. The EU institutions decided against an EU-wide type approval authority. Instead, each member state will retain its own type approval authority, and mutual recognition of type-approval certificates issued by the different national authorities will still apply. Nevertheless, the EC will play a stronger role than today, as in the future it will have the power to carry out its own verification testing and to initiate and monitor vehicle recalls. The regulation will also allow the EC to impose fines of up to 30,000 EUR per noncompliant vehicle on manufacturers, but only in cases where a penalty has not been previously issued by a member state.

The new regulation will introduce independent market surveillance. This is different from the current EU type-approval scheme, which relies only on the pre-production type-approval tests and verification tests performed by the manufacturers on in-production vehicles. From September 2020 onwards, EU member states—and the European Commission—will be required to perform tests on vehicles already on the market, in order to ensure that vehicles in use still meet their emission limits. For this purpose, each member state shall install a market surveillance authority independent of the type approval authority. Each member state will be required to conduct a minimum number of vehicle compliance tests per year. There will have to be at least one test per every 40,000 new motor vehicles registered in the respective member state in the preceding year, with at least 20% of the tests emissions-related. Countries with a low number of car registrations will have to conduct a minimum of five tests per year.

The new framework will also strengthen enforcement mechanisms available to EU member states. Today, a member state cannot take measures against non-compliant vehicles sold, but not produced, in their national markets, other than notifying the type-approval authority of the country that issued the vehicles' type-approval certificate and waiting for it to take action. In the future, member states will be allowed to restrict or prohibit the usage of affected vehicles or require actions by the manufacturer. If there are no objections from other member states within one month, all member states must apply the same measures. In case of objections, the EC has the last say. The implications of this new provision can be illustrated by the ongoing case of the German type-approval authority claim that some vehicles of the Fiat-Chrysler group (FCA) are applying an illegal defeat device that would shut off the exhaust aftertreatment after 22 minutes, while the Italian type-approval authority, which issued the type-approval of the suspicious vehicle models, has so far refused to take any action.⁵ The new provision would allow Germany to require action by FCA or restrict the use of effected vehicles. In addition to improved enforcement, the new regulation also grants type-approval authorities and technical services access to vehicle software, a step intended to safeguard against the use of defeat devices.

4 European Parliament, "Car approvals: Parliament endorses new rules to prevent emissions cheating," April 2018. Retrieved from <http://www.europarl.europa.eu/news/en/press-room/20180411IPRO1522/car-approvals-parliament-endorses-new-rules-to-prevent-emissions-cheating>

5 European Parliament, "Committee of Inquiry into Emission Measurements in the Automotive Sector (EMIS). EMIS hearing of 11 October 2016, Questions to Mr Zinke (KBA)". Retrieved from http://www.europarl.europa.eu/cmsdata/112699/20161011-Zinke_KBA_.pdf

The original proposal by the EC intended to break up the financial relationship between car manufacturers and their technical services. Under the current EU type-approval system, member states designate technical services to perform testing and inspection tasks for which they are paid directly by vehicle manufacturers. To avoid any potential conflict of interest and reinforce the independence of testing, a type-approval fee structure was considered to cover the costs of all type-approval tests and inspections carried out by the technical services. However, the European Parliament and EU member states rejected this part of the EC's proposal, so that also in future years technical services will continue to receive funding directly from car manufacturers. The regulators did however recognize the key role that technical services have in the type approval process. In the future, technical services will only receive designations for a limited time, which will only be extended based on the result of on-site assessments. Such on-site assessments can also be conducted by the EC.

AMENDMENT TO REGULATION EU 2017/1151

On May 3, 2018, the EU member states adopted an amendment⁶ to regulation EU 2017/1151⁷, which does not need to be approved by the European Parliament. It will therefore apply 20 days after publication in the EU Official Journal, which is expected towards the end of the year. In the following section, we describe some key elements of this recently adopted amendment.

FOURTH PACKAGE OF THE RDE TEST PROCEDURE

Since September 2017, the real driving emissions (RDE) test procedure is a mandatory part of the type-approval procedure for new passenger cars and light-commercial vehicles in the EU. The on-road RDE test complements the laboratory test and is intended to ensure that the emission levels of vehicles under real-world driving conditions stay low. The first two packages of RDE legislation were adopted in 2015 and published in 2016 as regulations (EC) 2016/427⁸ and (EC) 2016/646⁹, amending regulation (EC) 692/2008. The third legislative package was adopted in 2016 and published in 2017, as part of regulation (EU) 2017/1151¹⁰, which

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- 6 European Commission. COMMISSION REGULATION (EU) .../... amending Directive 2007/46/EC, Commission Regulation (EC) No 692/2008 and Commission Regulation (EU) 2017/1151 for the purpose of improving the emission type approval tests and procedures for light passenger and commercial vehicles, including those for in-service conformity and real-driving emissions and introducing devices for monitoring the consumption of fuel and electric energy. Retrieved from https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2018-1297632_en
- 7 Commission Regulation (EU) 2017/1151 of 1 June 2017 supplementing Regulation (EC) No 715/2007 of the European Parliament and of the Council on type-approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and on access to vehicle repair and maintenance information, amending Directive 2007/46/EC of the European Parliament and of the Council, Commission Regulation (EC) No 692/2008 and Commission Regulation (EU) No 1230/2012 and repealing Commission Regulation (EC) No 692/2008. Retrieved from <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32017R1151>
- 8 Commission Regulation (EU) 2016/427 of 10 March 2016 amending Regulation (EC) No 692/2008 as regards emissions from light passenger and commercial vehicles (Euro 6). Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32016R0427>
- 9 Commission Regulation (EU) 2016/646 of 20 April 2016 amending Regulation (EC) No 692/2008 as regards emissions from light passenger and commercial vehicles (Euro 6). Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32016R0646>
- 10 Commission Regulation (EU) 2017/1151 of 1 June 2017 supplementing Regulation (EC) No 715/2007 of the European Parliament and of the Council on type-approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and on access to vehicle repair and maintenance information, amending Directive 2007/46/EC of the European Parliament and of the Council, Commission Regulation (EC) No 692/2008 and Commission Regulation (EU) No 1230/2012 and repealing Commission Regulation (EC) No 692/2008. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32017R1151>

repeals regulation (EC) 692/2008 and was amended by (EC) 2017/1154¹¹. Figure 1 summarizes the political timeline of the RDE legislative packages.

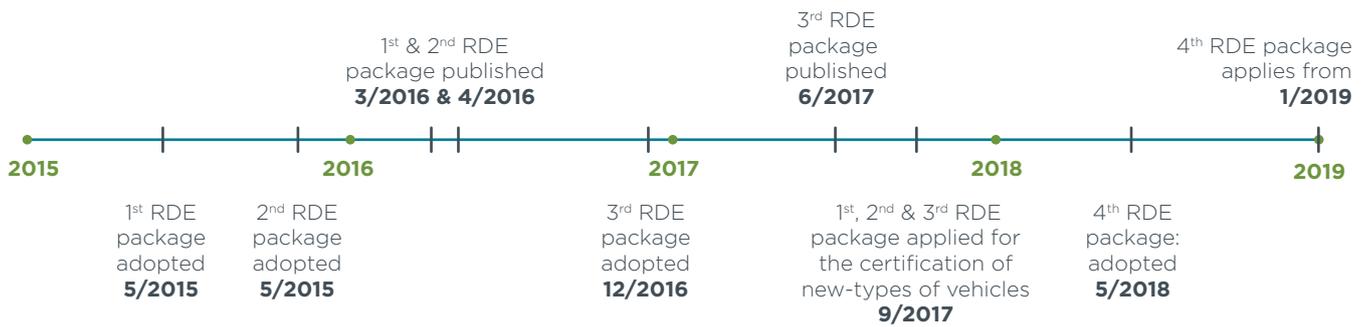


Figure 1. Timeline of the four RDE legislative packages.

The first RDE package introduced the basic features of the RDE test, such as characterization of the RDE trip, the vehicle family concept, a description of the data evaluation tools, the technical requirements of the Portable Emissions Measurement Systems (PEMS) equipment, and reporting obligations. The second package added dynamic boundary conditions as well as a limit for altitude gain. A summary of those first two RDE packages is included in an earlier ICCT policy update.¹² Key elements of the third RDE package include the introduction of a not-to-exceed (NTE) limit for particulate number, the addition of a cold start element to the test procedure, specific provisions for testing hybrid-electric vehicles, as well as a calculation procedure for taking into account regeneration events, such as for diesel particulate filters.

As part of the fourth RDE package, the conformity factor for nitrogen oxide (NO_x) is slightly lower—1.50 instead of 1.43—as a result of a revision of the PEMS measurement uncertainty. Research results by the EC have shown that the conformity factor could be as low as 1.24 for a NO_x limit of 80 mg/km.¹³ The emissions of a valid RDE test are compliant with the regulation if the reported distance-specific mass of emissions are below the corresponding NTE limit. The NTE limit, the product of the Euro 6 laboratory emission limit times the conformity factor of the corresponding pollutant, is valid both for the total trip and its urban section. As a result, an RDE test will only be passed successfully if the NO_x emissions are below a “Euro 6d” threshold of 114 mg/km for diesel cars and 86 mg/km for gasoline cars¹⁴. This will be required from January 2020 onwards for

- 11 Commission Regulation (EU) 2017/1154 of 7 June 2017 amending Regulation (EU) 2017/1151 supplementing Regulation (EC) No 715/2007 of the European Parliament and of the Council on type-approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and on access to vehicle repair and maintenance information, amending Directive 2007/46/EC of the European Parliament and of the Council, Commission Regulation (EC) No 692/2008 and Commission Regulation (EU) No 1230/2012 and repealing Regulation (EC) No 692/2008 and Directive 2007/46/EC of the European Parliament and of the Council as regards real-driving emissions from light passenger and commercial vehicles (Euro 6). Retrieved from <https://eur-lex.europa.eu/eli/reg/2017/1154/oj>
- 12 Francois Cuenot, Peter Mock, *Real-Driving Emissions test procedure for exhaust gas pollutant emissions of cars and light commercial vehicles in Europe* (ICCT: Washington, DC, 2017). Retrieved from <https://www.theicct.org/publications/real-driving-emissions-test-procedure-exhaust-gas-pollutant-emissions-cars-and-light>
- 13 Giechaskiel B., et al. “Real driving emissions: 2017 assessment of Portable Emissions Measurement Systems (PEMS) measurement uncertainty,” European Commission Joint Research Centre (JRC), May 2017. Retrieved from <http://publications.jrc.ec.europa.eu/repository/bitstream/JRC109841/kjna29138enn.pdf> https://circabc.europa.eu/sd/a/c6054012-508c-4eb3-9cc2-728d2153f702/Margins%20NOx%202017%20report_v9c_public.pdf
- 14 These emissions limits apply for M1 and N1 class I vehicles only (passenger cars and light-commercial vehicles with a mass up to 1,305 kg). Higher emission limits apply for N1 class II and III and N2 vehicles.

newly developed models—and from January 2021 onwards for all new vehicles¹⁵. The temporary, “Euro 6d-TEMP” conformity factor for NO_x remains unchanged at 2.1 until the end of 2019 for new types of vehicles and until the end of 2020 for all new vehicles, but manufacturers can choose to type-approve their cars to the final, Euro 6d limits today. The conformity factor for particulate number (PN) emissions also remains at 1.50, as defined in the third package of the RDE regulation. Carbon monoxides (CO) are included in the RDE measurements but remain excluded from any NTE limit.

The criteria for determining whether an RDE trip is valid was also revised in order to prevent a biased driving style that could lead to elevated emissions. Figure 2 summarizes the steps for determining whether an RDE trip is valid and for calculating the final RDE test result, based on the original raw emission measurements. The trip requirements and boundary conditions were defined in the first two RDE packages. Previously, it was possible to make use of either the Moving Average Window (MAW) method, which takes into account the distance-specific CO₂ emissions during a trip, or the Power Binning method, which normalizes the emissions according to an expected power demand distribution during a trip, to validate RDE trips and calculate emissions. Fulfilling the validity criteria of one of those two methods was sufficient for an RDE test to count as valid. With the introduction of the fourth RDE regulation, a modified MAW method will become the only method for determining the validity of an RDE test. The CO₂ emission level of an RDE trip is the main indicator for the emission severity of the trip: an RDE test is considered valid if at least 50% of the urban, rural and motorway CO₂ windows are within the allowed tolerances.

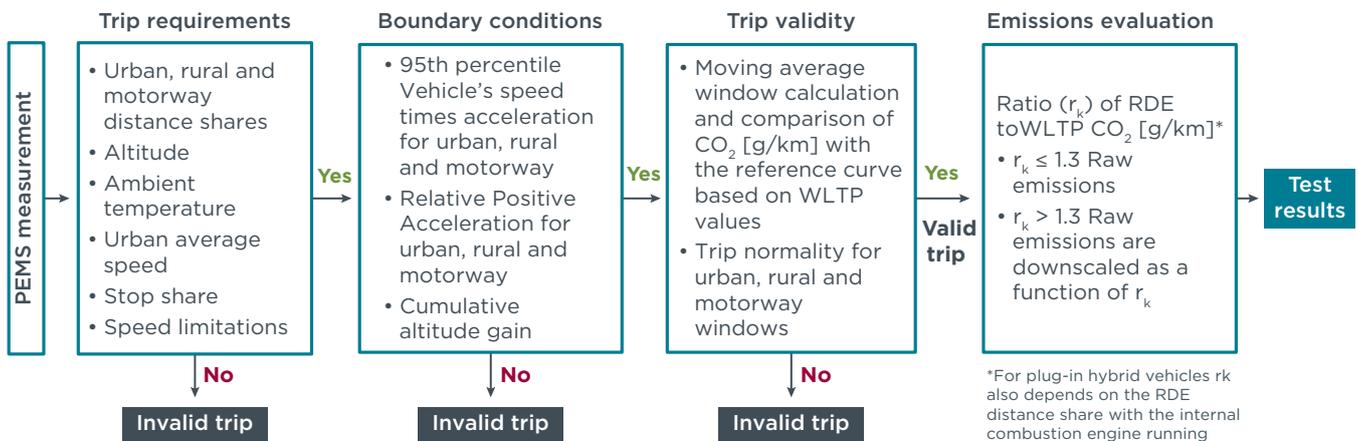


Figure 2. Steps of an RDE test validity procedure and emission calculations from January 2020.

In addition, the fourth RDE regulation introduces a new, single evaluation method for regulated emissions that replaces the two existing moving average window and power binning methods. As part of this method, the CO₂ emission level during the RDE on-road test are compared to the CO₂ emission level of the vehicle during the Worldwide Harmonised Light Vehicle Test Procedure (WLTP). If the level of CO₂ measured during RDE is less than 20% above during WLTP (30% from January 2020 onwards), the RDE pollutant emissions are reported as measured during the RDE test (raw). Otherwise, the raw pollutant emissions are corrected downwards as a function of the ratio between CO₂ RDE to WLTP. Again, CO₂ emissions are used

¹⁵ These dates apply to M1 and N1 class I vehicles only (passenger cars and light-commercial vehicles with a mass up to 1,305 kg). The introduction of Euro 6d-TEMP and 6d occur one year later for N1 class II and III and N2 vehicles.

here as a proxy for the severity of an RDE trip. For plug-in hybrid vehicles, special provisions apply.

IN-SERVICE CONFORMITY TESTING

As part of the amendment, a minimum number of in-service conformity (ISC) checks¹⁶ of vehicles was introduced to be performed by the granting type approval authority. Today, ISC checks are entirely in the hands of car manufacturers, and they are only carried out for air pollutant emissions, not for CO₂. Part of this responsibility will now shift to the respective type-approval authorities, which will perform WLTP and RDE tests (the latter only for NO_x and particulate number emissions), in addition to the WLTP tests carried out by manufacturers. The granting type approval authority must gather all relevant information on possible emission non-compliances relevant for deciding which ISC families to check in a particular year. The number of compulsory annual ISC checks level is set to 5% of PEMS families or a minimum of two families per manufacturer. This is significantly lower than the 20% that stakeholders, such as environmental NGOs, were originally asking for.¹⁷ In addition to the granting type approval authorities, ISC checks can be performed by other type approval authorities, or commissioned by any third party, provided that an accredited laboratory or designated technical service carries out the testing on their behalf. All parties shall report the results in an electronic platform to coordinate in-service conformity testing.

The ISC procedure is based on a sequential sampling method. A sample of vehicles pulled from the same vehicle family are tested consecutively until a “pass” or “fail” decision is reached. The revised ISC requirements aim to strike a balance between tighter requirements for passing an ISC check and limiting the testing burden. As a result, the maximum number of vehicles to decide whether an ISC check is passed is reduced from 20 to 10 vehicles of a vehicle family. At the same time, the thresholds for failing an ISC check are lowered. For instance, a vehicle family for which 50% of the vehicles are likely to fail the test, under the current system, would still have a more than 75% probability to pass the ISC check. Under the new system, with the same percentage of vehicles failing the test, the probability to pass the ISC would only be slightly above 50% (Figure 4).

16 In comparison to ISC checks, the scope of market surveillance testing—as introduced by the revised type approval framework directive, is wider, including not only emissions but also safety testing, making use not only of laboratory and PEMS testing but also remote sensing as well as on-board measurements. Market surveillance checks can also serve as a pre-screening of vehicle models that will then be selected for more in-depth ISC testing.

17 Transport & Environment, “Letter to TCMV members: European Commission’s proposal regarding the RDE 4th package & WLTP 2nd act,” April 2018. Retrieved from https://www.transportenvironment.org/sites/te/files/publications/2018_04_TE_letter_TCMV_members_vote_for_RDE_4_and_WLTP_2.pdf

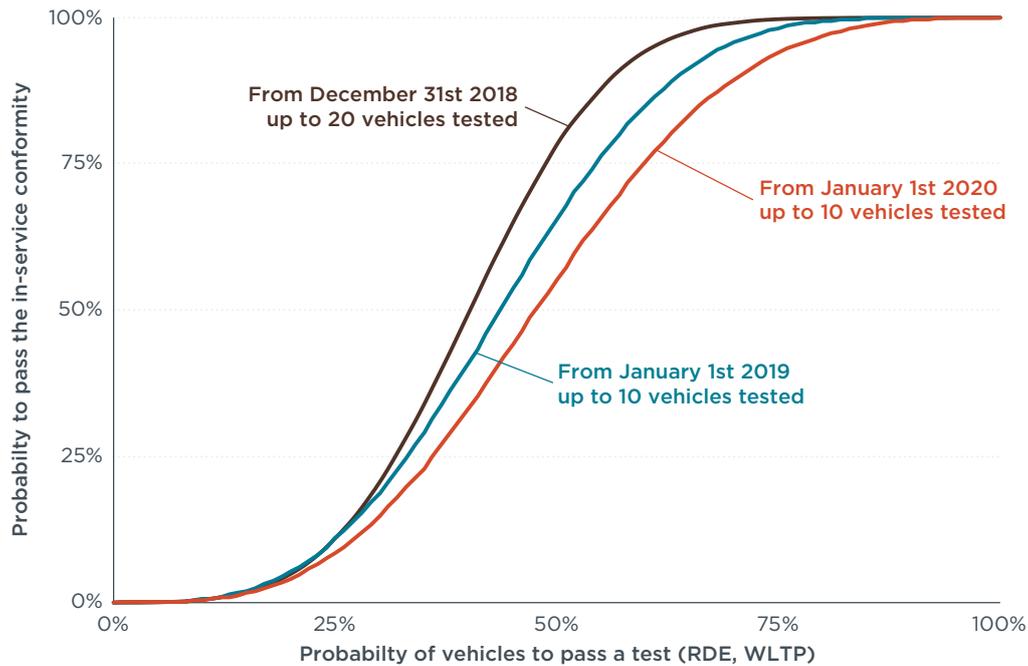


Figure 3. Comparison of the outcome of new statistical procedures. The probability to pass the ISC check is reduced when vehicles have a significant chance to fail the WLTP or RDE test. Evaporative and low temperature tests have a shorter sampling plan and are only voluntary.

FUEL CONSUMPTION METERS

From January 2020 onwards for new vehicle types, and one year later for all new vehicles, manufacturers have to determine on-board the instantaneous as well as the lifetime fuel consumption of each vehicle—the so-called fuel consumption meter. In addition, the electric energy consumption for plug-in electric vehicles will have to be recorded, however only for the lifetime of the vehicle, not the instantaneous consumption. The accuracy of the data recorded will have to be within $\pm 5\%$, i.e. if tested in a WLTP test, the fuel consumption meter reading shall not deviate more than 5% from the vehicle's fuel consumption determined by the laboratory equipment. While vehicle manufacturers are widely applying fuel consumption meters for internal data collection purposes already today, in the future all interested parties will be able to access the recorded data via the on-board diagnostics (OBD) interface of the vehicle. How the fuel consumption meter readings of individual vehicles will be systematically collected, aggregated and analyzed by the European Commission will be addressed in future regulations.

SUMMARY AND OUTLOOK

With the recent adoption of several measures to improve the procedure for determining emissions of new road vehicles, the EU has taken a major step towards preventing another Dieselgate. However, some aspects originally proposed by the EC (and supported by NGOs and consumer associations) were not included in the final regulation, such as the creation of an EU-wide type approval authority or breaking the financial ties between vehicle manufacturers and technical services. In addition, thorough implementation of any of the adopted measures in practice will also require that member states provide sufficient financial resources for their type approval bodies.

For the future, the EC have signaled that there will not be any further packages of the RDE regulation. Instead, we expect the EC to focus on developing a Euro 7 regulation. While the previous work on RDE and WLTP was centered around making changes to the way in which vehicle emissions are being measured, key aspects of a Euro 7 standard would be to revise the current emission limits, to harmonize emission limits for different propulsion concepts and technologies, and to add pollutants which are currently not yet regulated.