

Working document L-EPPR-01-04

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Environmental and Propulsion Performance Requirements for L-category vehicles (L-EPPR)



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Introduction to Study

- § The EC is reaching the end of the process of revising type approval procedures for L-category vehicles
 - powered cycles, mopeds, motorcycles, tricycles and quadricycles
- § The EC wishes, as far as possible, to replace the legislative text in the REPPR with references to international regulations to increase harmonisation
- § This informal working group has been established within the Working Party on Pollution and Energy (GRPE) at the UN for this task
- § On behalf of the EC, the independent consortium comprising of TRL and Ecorys are performing a study to propose changes to various UN regulations to achieve this

Areas to be assessed

§ Categorisation

- L-category vehicle classification (L1e-B, L3-A1 etc.)

§ Propulsion performance

- Maximum vehicle speed
- Maximum propulsion power and torque (engine test)
- Maximum peak power (whole vehicle test)

§ Emissions (tailpipe related)

- Type I test – tailpipe emissions (over driving cycle)
- Type II test – idle emissions
- Type V test – durability
- Type VII test - CO₂ emissions, fuel/energy consumption, and range

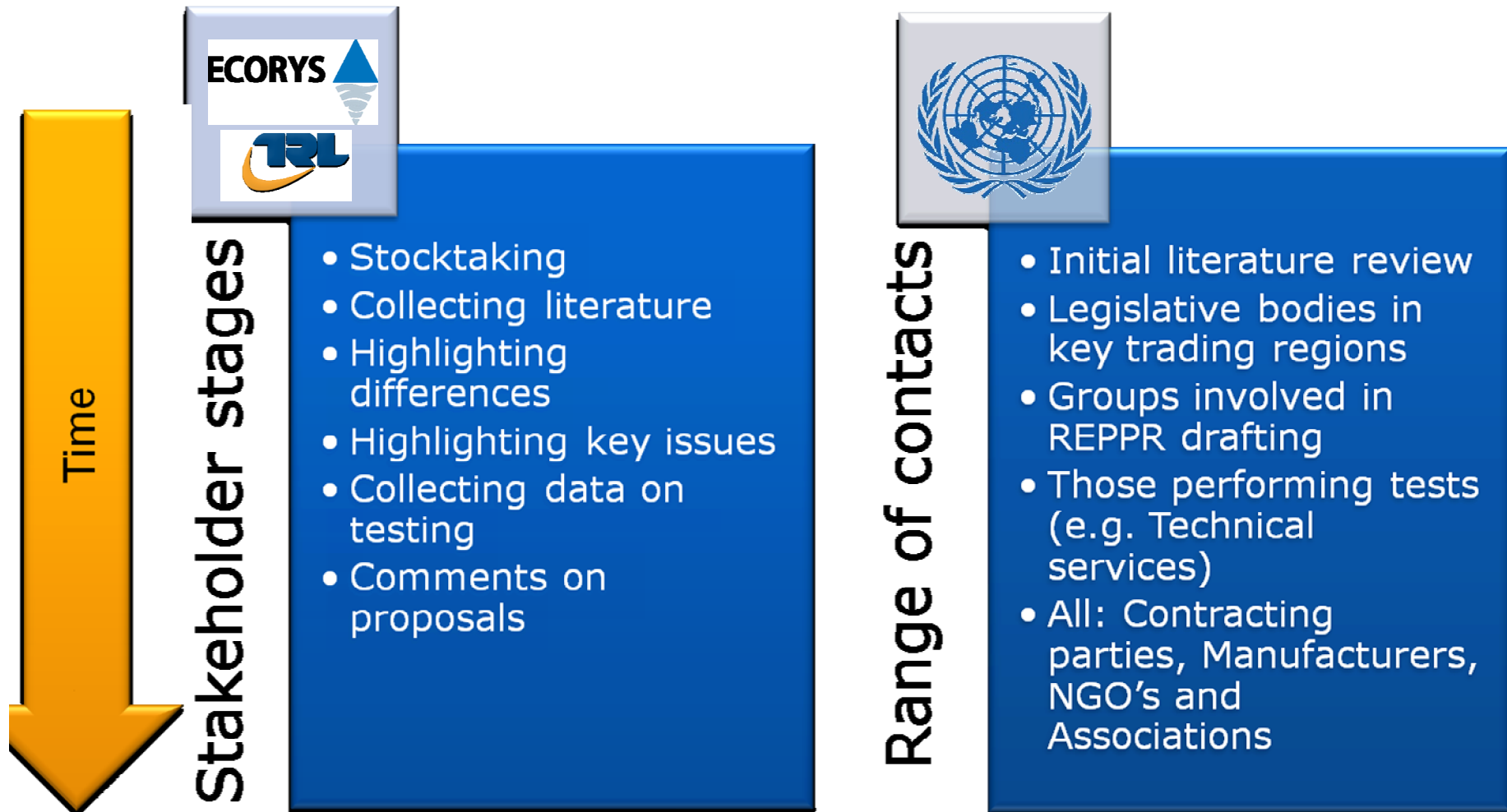
§ Emissions (other)

- Type III test – crankcase emissions
- Type IV test – evaporative emissions
- Type VIII test – OBD (environmental part)

L-category vehicle type-approval test - overview

L-category vehicle type approval of emissions							
	<p>International harmonisation of L-category vehicle classification (Task 4.10)</p>	<p>Propulsion performance requirements (Task 4.9)</p>	<p>Test Type I, tailpipe emissions test after cold start; Test Type II, tailpipe emissions test at (increased) idle / free acceleration test; Test Type VIII, measurement of CO2 emissions, fuel consumption, electric energy consumption and electric range determination; (task 4.2, 4.3, 4.7)</p>	<p>Test Type III, emission test of crankcase gases; (task 4.4)</p>	<p>Test Type IV, evaporative emissions test (Task 4.5)</p>	<p>Test Type V, durability testing of pollution control devices (Task 4.6)</p>	<p>Test Type VIII, on-board diagnostics test (environmental part only of OBD) (Task 4.8)</p>
Documents used for reference	<p>EU Codecision Act Annex I, REPR UN RE3 EU Directive 2002/24/EC JPN and USA legislation Other regional legislation GTR No. 2 Output from WLTP informal groups</p>	<p>EU Codecision acts EU Directive 95/1/EC UN R24, R68, R85 International standards</p>	<p>EU REPR UN R40, R47, GTR No.2, R101, R83 EU Directive 97/24/EC</p>	<p>EU M&N category legislation International standards</p>	<p>EU REPR US CRF Title 40 part 86</p>	<p>EU REPR US CRF Title 40 part 86</p>	<p>EU RVCR UN R83 International standards</p>
Testing Process							
Location for regulation and issues	<p>Update UN RE3 and S.R.1 Proposal to revise classification criteria</p> <p>Moped issue Maximum vehicle speed Km -> mile/h 45 -> 28 (EC) 48 -> 30 (UK) 50 -> 31 (US, UN, EU)</p> <p>Motorcycle issue Addition of: Enduro and Trail variants of L3e-A1/2/3</p> <p>Quadricycle issue Sub categories ATV, Sbs Power, weight limits</p>	<p>New and consolidated Regulation 1958 Agreement Regulation and/ or 1998 GTR? OR Update R85 and R68 OR Add to Type I test regulation (when that is chosen)</p> <p>Issue Not all vehicles covered</p> <p>Issue Alternative drives</p>	<p>Update R40 and/or R47 OR Update GTR No. 2 OR Extend scope of R101 OR New regulation to encompass all</p> <p>Issue Harmonising test methods Test chemicals, temperatures, tolerances, equipment</p> <p>Issue Harmonising cycle between regions</p> <p>Type VII issue Open scope of R101 or consolidate</p> <p>Issue Which UN agreement to use: 1958 or 1998?</p>	<p>Either take from M&N category legislation OR Develop new test</p> <p>Transfer both into UN regulation</p> <p>Issue Technology specific avoid? Reduce cost</p>	<p>US EPA permeation test US CARB SHED test</p> <p>Transfer both into UN regulation</p> <p>Issue Rectifying any issues with the specifics of the tests</p>	<p>US EPA AMA cycle EC SRC LeCV</p> <p>Transfer both into UN regulation</p> <p>Issue Harmonising specifics of the tests</p>	<p>Based on R83 PLUS Specifying additional parameters to monitor PLUS Standard communication protocol and socket</p> <p>Issue Non-open standards?</p> <p>Issue Categories to cover?</p> <p>Issue Separation of environmental and functional onboard diagnostics</p> <p>Issue Separation of OBD Stage I (similar to US comprehensive components) and Stage II, emission verification?</p>
Vehicle	<p>Propulsion performance performed on different engine(s)/motor(s) And vehicle</p>	<p>Test Types I, II, III, VII performed on the same vehicle(s)?</p>	<p>Test Types I, II, III, VII performed on the same vehicle(s)?</p>	<p>Test Types I, II, III, VII performed on the same vehicle(s)?</p>	<p>Test Types V, IV, and VIII performed on the same vehicle(s)?</p>	<p>Test Types V, IV, and VIII performed on the same vehicle(s)?</p>	

Stakeholder (1)



Assessment of impacts, costs and benefits (1)

§ New L-EPPR legislation will result in changes that have impacts

§ Impacts will affect different stakeholders, including:

- Manufacturers of whole vehicles and parts
- Testing houses
- Type approval authorities
- Consumers

§ Main impacts will result from:

- Introduction new test types
- Global harmonisation of test procedure
- Global harmonisation of test equipment, tolerances, and definitions

§ Impact categories:

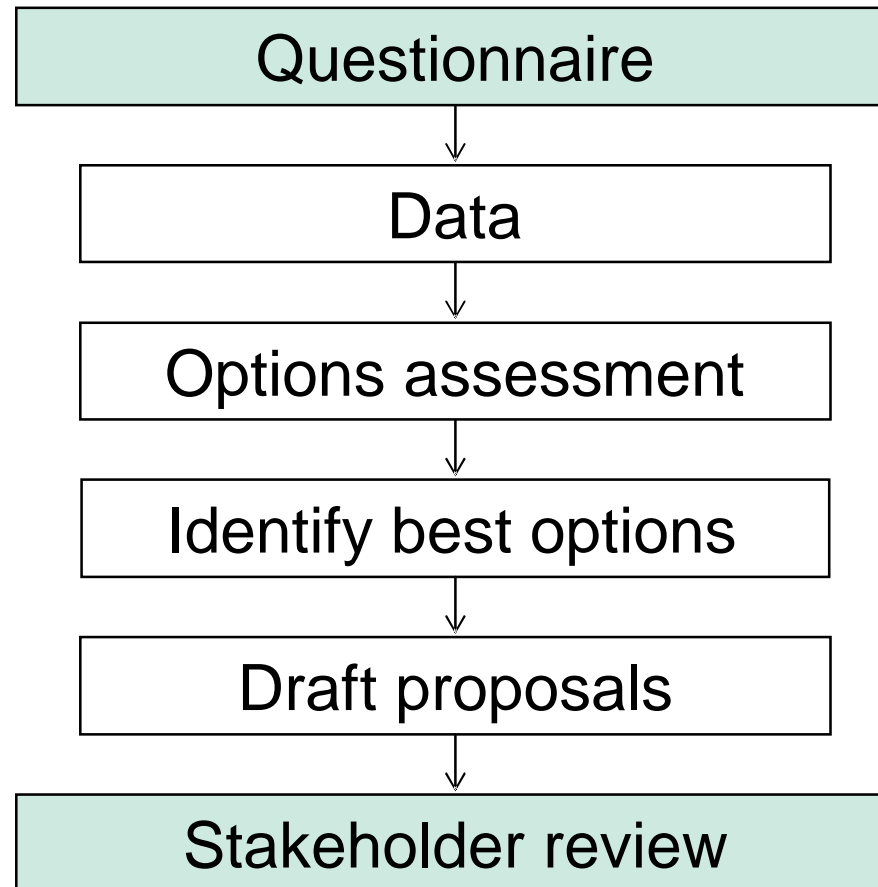
- Environmental
- Social (safety; employment)
- Economic (costs changes both positive and negative; competitiveness)



Assessment of impacts, costs and benefits: (2)

- § Where possible, impacts will be quantified and monetised
- § Policy interventions will be compared against baseline
The baseline is “business as usual” with the current legislation
- § Pros and cons of policy intervention will be indicated based on the assessment of the impacts
- § Data on impacts are collected:
 - Desk research
 - Stakeholder consultation
 - Questionnaire
 - Targeted in-depth interviews

Consultation process for benefit assessment (3)



Key Dates: Questionnaire (1)

§ Questionnaire launched: Available now

Contact us for a link: int-l-cat-leg@trl.co.uk

§ Returns required by: 31 March 2013

We would greatly appreciate if all relevant documents could be brought to our attention by this date also

§ Results available: 15 May 2013

prior to 66th GRPE meeting

Key dates (2)

§ December 2012: Publicising study
Email to stakeholders

§ 10 January 2013
Questionnaire published by Ecorys and TRL

§ 18 January 2013: GRPE (65th session)
1st meeting of the L-EPPR group, review among others: Rules of Procedure (RoP), Terms of Reference (ToR) & Draft roadmap

§ 12 – 15 March 2013: WP.29 (159th session)
Progress report

§ TBD: Multiple L-EPPR subgroup meetings or
conference calls
To finalise ToR, RoP and roadmap

Key dates (3)

§ 4-7 June 2013: GRPE (66th session)

Proposed 2nd meeting L-EPPR group: Adoption of RoP, ToR & roadmap, progress report, consultation results and 1st draft proposals

§ 12-15 November 2013: WP.29 (161th session)

Adoption of GRPE decision and progress report

§ 2013-2016: Multiple L-EPPR subgroup meetings

Regularly reporting to GRPE and the Administrative Committees AC.1 and AC.3 in WP29

§ 2014-2016: Adopt new and/or amendments to UN Reg(s) and GTR(s);

Regions accede to agreed updated legislation

Thank you

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ANNEXES

§ Categorisation

- L-category vehicle classification (L1e-B, L3-A1 etc.)

§ Propulsion performance

- Maximum vehicle speed
- Maximum propulsion power and torque (engine test)
- Maximum peak power (whole vehicle test)

§ Emissions (tailpipe related)

- Type I test – tailpipe emissions (over driving cycle)
- Type II test – idle emissions
- **Type V test – durability of pollution control devices**
- Type VII test - CO₂ emissions, fuel/energy consumption, and range

§ Emissions (other)

- Type III test – crankcase emissions
- Type IV test – evaporative emissions
- Type VIII test – OBD (environmental part)

Legislative bodies' nomenclature

- United Nations: United Nations Economic Commission for Europe
 - Regulation ##, short form: R##
 - Global technical regulation Number ##, short form: GTR #
- European Union: European Commission
 - Directive year/##/EC (or EEC pre 1993)
 - Regulation (EU) No ##/year
 - The REPPR is a draft Regulation (Regulation and on the environmental and propulsion performance requirements of two- or three-wheel vehicles and quadricycles)
- United States of America:
 - Federal: Code of Federal Regulations Title ## Part ## §##, short form: CFR ##
 - California air resource board: California Code of Regulations Title ##, short form: CCR ##. Vehicle Code §##, short form: VC §##
- People's Republic of China: Ministry of Environmental Protection
 - GB emission standards ##/year, short form GB ##/year
- Republic of India: Ministry of Environment & Forests:
 - Bharat regulations
- Japan: Ministry of Land, Infrastructure, Transport and Tourism

Categorisation

Different categorisation methods are used to define: the type which defines the construction/safety/emission requirements, the performance and propulsion method for deciding the specific testing methods, and there are additional categorisation methods used in licencing, taxation, etc..

§Legislation:

- United Nations: UN RE3 and SR1 detail categorisation of all motor vehicle types, and the definitions of key metrics. GTR 2 used a performance based categorisation for testing.
- EU: The REPPR follows the base categories of UN RE3 for vehicle type, but with more detailed sub-categorisation. The Type I and V tests both use categorisation based on GTR 2.
- China: GB/T 15089-2001 states the type categories and GB 14622-2007, and details the performance split for L-category vehicle testing. Both of which are similar to the EU and UN systems.

Categorisation

§ Legislation, continued

- USA: Federal: Motor vehicles are defined in CFR Title 40 Part 86 Subpart E (§ 86.401 to § 86.449), with §86.419-2006 defining motorcycle classes by engine size. CFR Title 49 Part 523 covers some aspects of Quadricycles.
- California: VC §400 to § 406, separately define motor vehicles, including motorcycles, mopeds and motorised bicycles. Emission testing uses CCR Title 13 §1958 which classes 2-wheelers by engine size.
- India: The vehicle performance and engine capacity based categorisation is similar to GTR 2. Further information would be gladly accepted
- Other regions: Further information would be gladly accepted

§ Possible harmonization issues

- The definitions such as those for mass and power to engine capacity comparison are important for harmonization of the categories

Propulsion performance

§ Legislation

- United Nations: UN R24 (applicable to vehicle categories L, M, N) and UN R68, R85 (applicable only to vehicle categories M, N)
- European Union
 - Current status: Directive 95/1/EC (as amended up to 2006/27/EC) including a reference to vehicles International Electrotechnical Commission (IEC) 60034-1 for electric
 - Forthcoming: REPPR including a reference to UN R85 for electric and hybrid vehicles

§ Standards

- ISO:
 - Maximum speed: ISO 7116:2011 (mopeds), ISO 7117:2010 (motorcycles)
 - Power/Torque: ISO 4106:2012 (motorcycles), ISO 4164:2012 (mopeds)
- EN:
 - Maximum speed: BS EN 1821-1:1997, BS EN 1821-2:1999 specifically address electric and hybrid vehicles; apply to tricycles and quadricycles (not to motorcycles)

Propulsion performance

§ Maximum vehicle speed

- Test procedures defined in REPPR and ISO 7116, ISO 7117 are similar
- Differences between REPPR and ISO:
 - Permissible test track configurations
 - Permissible longitudinal slope of the test track
 - Required length of measurement sections
 - Atmospheric test conditions (atmospheric pressure, humidity)
 - Required number of repeated test runs

§ Maximum power and torque

- Test procedures defined in REPPR and ISO 4106, ISO 4164 are similar
- Differences between REPPR and ISO:
 - Measurement tolerances (e.g. torque, rotational speed, fuel temperature, fuel consumption, test room humidity)
 - Atmospheric test conditions (minimum dry atmospheric pressure)

Test type I, II, V, VIII – Tailpipe related emissions

The Type I test for pollutant emission details a driving cycle which can also be used for the array of type VIII tests which cover CO₂ emissions, (electric) energy consumption, range and the calculation of fuel consumption.

The type II test, (typically performed following the Type I), is used to test a vehicles roadworthiness in regards to pollutant emission and smoke, in some regions it is also used for in-use testing.

§Legislation

- United Nations: GTR No. 2 contains the WMTC test cycle and R40 and R47 contain two older test cycles. M & N category vehicles follow the cycle in R83, however this is currently in the process of being updated by the WLTP test procedure and cycle. R101 contains the current M & N cat Type VIII tests, however this specifies the older car driving cycle.

Test type I, II, V, VIII – Tailpipe related emissions

§ Legislation, continued

- EU: The GTR 2, R40 and R47 driving cycles with testing procedures differing from the UN's.
- USA: A range of test cycles are used in different states depending upon local vehicle use. Further information would be gladly accepted
- China: GB 14621-2011 (replacing GB 14621-2002) and GB 18285-2005 cover the Type II test. GB 18176-2007 (replacing GB 18176-2002) is the moped Type I test with GB 14622-2007 (replacing GB 14622-2002) used for motorcycles. GB 19758-2005 is used to test smoke.
- India: For 4-wheelers the Bharat regulations, stages II, III and IV are used. Note: India uses a different test type numbering. Further information would be gladly accepted
- Other regions: Further information would be gladly accepted

Test type III – Crankcase emissions

The Type III test is historically significant being, being the first area of vehicle emissions to be legislated.

Due to the different configuration of the engine, motorcycles use a different system, therefore a different test could be called for.

§Legislation

- UN: M & N category vehicles is covered by R83, this tests the functioning of a under pressure constant flow system.
- EU: The REPPR indicates requirements for a test. Various options under development
- Other regions: Further information would be gladly accepted

Test type V – durability of pollution control devices

§ Legislation

- United Nations: UN R83, applicable only to vehicle categories M, N (not L)
- European Union: forthcoming REPPR, introduction SRC-LeCV
- United States of America
 - Federal: Durability using the AMA cycle is set out in CFR Title 40 Part 86
 - California: CCR Title 13 substantially based on the CFR
- China: GB 14622-2007 sets out durability provisions based on US CFR
- Japan: durability regulations are in place, further information would be gladly accepted
- Other regions: further information would be gladly accepted

Test type V – durability of pollution control devices

§ Differences

- Driving schedule: Different driving schedules in different world regions. CFR/CCR and GB use the AMA cycle. REPPR offers the option to choose between SRC LeCV and AMA for a limited time.
- Required mileage: Different mileages required in CFR/CCR, GB and REPPR. REPPR allows full, partial or mathematical procedure; CFR/CCR do not have a purely mathematical procedure. R83 (vehicle categories M, N) offers a bench ageing procedure, i.e. catalyst and oxygen sensor are aged separated from the vehicle and then reinstalled for emission testing.
- Mileage accumulation dynamometer: Mileage accumulation on a dynamometer instead of a test track is possible within REPPR, CFR/CCR, GB, R83 (vehicle categories M, N). Technical provisions regarding the dynamometer differ between R83, REPPR and GB.
- Soak periods: Provisions regarding the frequency and duration of necessary soak periods differ between CFR/CCR/GB and REPPR. The conditions required are the same (“ambient conditions”).

Test type V – durability of pollution control devices

§ Differences continued

- Deviation from test vehicle: REPPR accepts differences between the tested vehicle and the vehicle to be type approved (different body style, gear box, wheels/tyres). GB offers the option to extend the type approval to a different type of motorcycle if the combination of engine and pollutant control device is the same.
- Golden parts: REPPR offers the repeated use of aged pollution control devices (“golden parts”) on different test vehicles (same vehicle type) later on in vehicle development. These can be used for durability performance verification and approval demonstration testing.
- Measurement of catalyst temperature: REPPR and R83 (vehicle categories M, N) require to measure the catalyst temperature during parts of the mileage accumulation procedure. R83 uses the collected data to determine parameters for the bench ageing procedure.

Test type IV – evaporative emissions

- United Nations: UN R83, applicable only to vehicle categories M, N (not L): hot soak test + 24 hour diurnal test
- European Union: Forthcoming REPPR: 1 hour diurnal + hot soak test
- United States of America
 - Federal: CFR Title 40 Part 86 sets out tank and tube permeation test (not needed for metal tanks and certified tubing)
 - California: CCR Title 13) sets out a 1 hour diurnal + running loss (if required) + hot soak test
A new proposal includes: tip test + hot soak + running loss + 3 day diurnal
- Other regions: further information would be gladly accepted

Test type IV – evaporative emissions

§ Possible issues

- Test types: different regions currently include different tests. The order and timing also vary between region, with CARB currently having the most demanding test. The whole sequence would have to be harmonised not just individual segments.
- Alignment with M & N class: these tests could be aligned with the M & N category procedures, but with a different driving cycle for conditioning, plus a more appropriate default vehicle volume for the calculations.
- SHED: the short diurnal test can be done with a fixed volume SHED, whereas the longer diurnal test require a variable volume SHED. However, for M & N type approval, technical services are likely to already have upgraded their SHEDs to variable volumes. The same SHEDs are normally used for cars and motorcycles.
- Running losses: these can be evaluated outside a SHED on a normal chassis dynamometer using a number of sampling points at critical areas (filler cap, carbon canister etc.). If a running loss SHED is required, this will be a require a very large capital investment.

Test type VIII – environmental on-board diagnostic (OBD) tests

§ Legislation

- United Nations: UN R83, applicable to M & N category to vehicle categories
- European Union: Forthcoming REPPR covering Stage I and Stage II
- United States of America
 - No current requirement for L-category, required for M & N category vehicles
- Other regions: further information would be gladly accepted

§ Possible issues

- OBD II: The OBD standard has already been well defined for M & N vehicles. Although this is too complex for L-category, it makes sense to align with a sub-set of the M & N procedures.

Note: The REPPR only deals with testing the OBD system and not the specifications for the OBD system (connector, communication protocols etc.) which are dealt with in the RVCR (regulation on vehicle construction requirements)