EU emissions regulations: An Update

March 2018

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The effects of dieselgate:

- *VW group vehicles were found with defeat devices both in the US and in Europe*
- *Investigations from MS showed that other vehicles also may emit more in real world conditions*
- *Some vehicles are already below the limits in some on-road tests*
- *Conclusions drawn from a single on-road test maybe misleading*

Properly maintained vehicles should not overemit

- The technical measures taken by the manufacturer must be such as to **ensure that the tailpipe and evaporative emissions are effectively limited, .. throughout the normal life of the vehicles under normal conditions of use.** Therefore, in-service conformity measures shall be checked for a period of up to five years or 100 000 km, whichever is the sooner.

And

- ***The use of defeat devices that reduce the effectiveness of emission control systems shall be prohibited.***
- 'defeat device' means any element of design which senses temperature, vehicle speed, engine speed (RPM), transmission gear, manifold vacuum or any other parameter for the purpose of activating, modulating, delaying or deactivating the operation of any part of the emission control system, **that reduces the effectiveness of the emission control system under conditions which may reasonably be expected to be encountered in normal vehicle operation and use**;

Need a robust system that guarantees independence, transparency, informed testing

History of RDE

2011-2015:

- Kick-off: Working group on RDE
  - Complementary procedure for type approval and in-service conformity testing of LDVs
  - Covering a wide range of normal operating conditions; limiting defeat strategies
- Evaluation of candidate procedures by JRC
- Development of a PEMS on-road test; pilot testing of PN-PEMS

2016:

- Implementation of RDE Regulations 2016/427 and 2016/646 as worldwide first on-road test procedure
  - Conformity factor 2.1 – applicable from Sept. 2017/2019 (new types/all new vehicles)
  - Conformity factor 1.5 – applicable from Jan. 2020/2021(new types/all new vehicles)
  - Compliance during urban driving and the entire RDE trip

2017:

- RDE 3rd Package
  - Testing of hybrid vehicles, coverage of cold-start and regeneration events, particle number emissions

2018:

- **4th Package:**
  - **Provisions for in-service conformity / Reviewing RDE procedure and adapting provisions to ensure practicality and effective emissions testing**

NTE principle

The emissions in real world driving shall not exceed the emission limits

A multiplicative conformity factor (CF) is necessary in order to account for the different measurement technique

Annual review for CF to bring it down to 1 (if possible)

Currently:

CF	NOx	PN
1 Sept 2017	2.1	1+0.5
1 Jan 2020	1+0.5	1+0.5

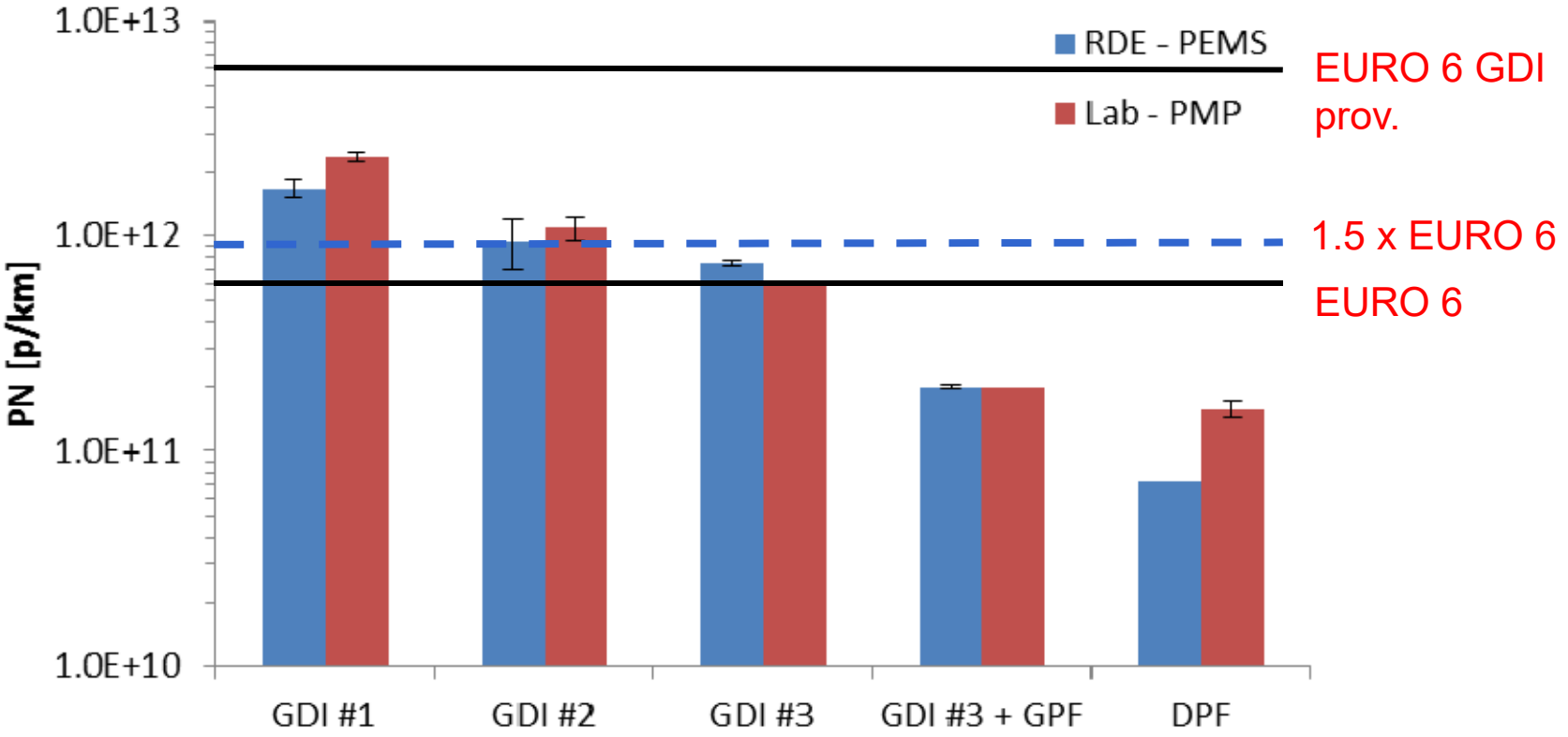
Possibility for manufacturer to declare a lower CF in the certificate of conformity (i.e. available to buyers)

All data in a publicly accessible database

Issues dealt in RDE 3

- *PN measurement method*
- *Cold start inclusion*
- *Provisions for Hybrids*
- *Regeneration*
- *Greater Transparency*
- *Other issues*

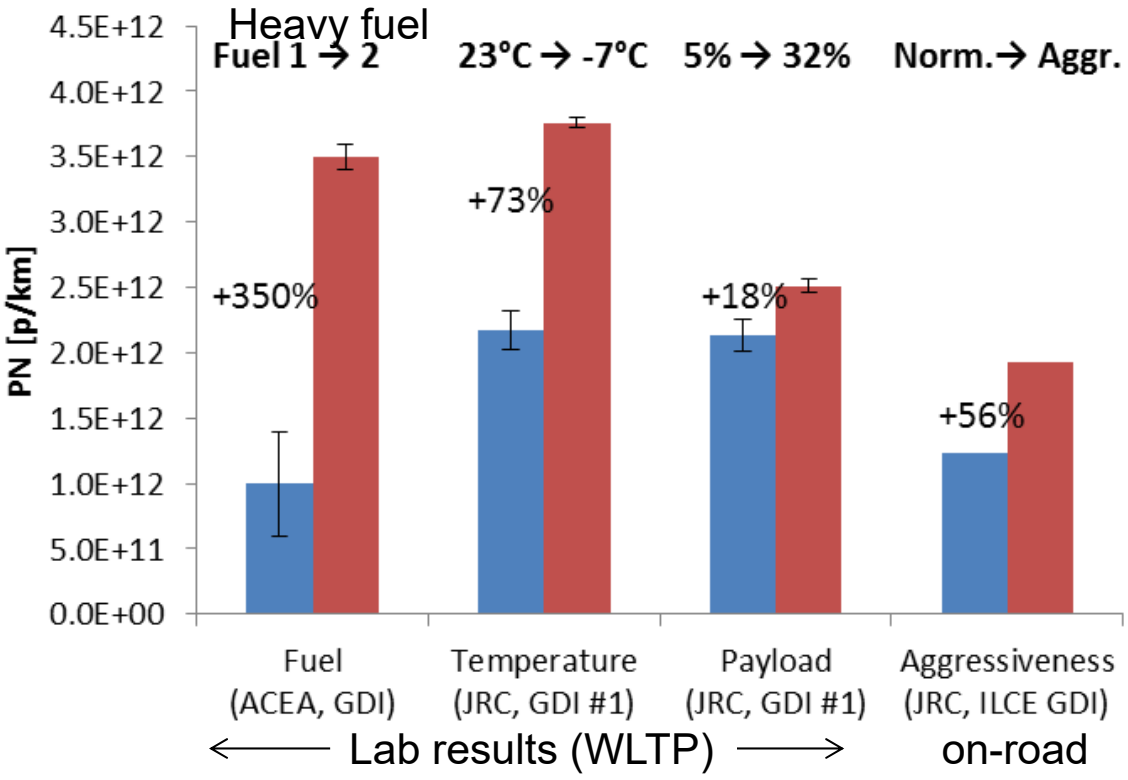
Margin added only to account for the uncertainty of the measurement equipment



Real world influence on particle generation

- The previous was just a snapshot
- Many other influences:

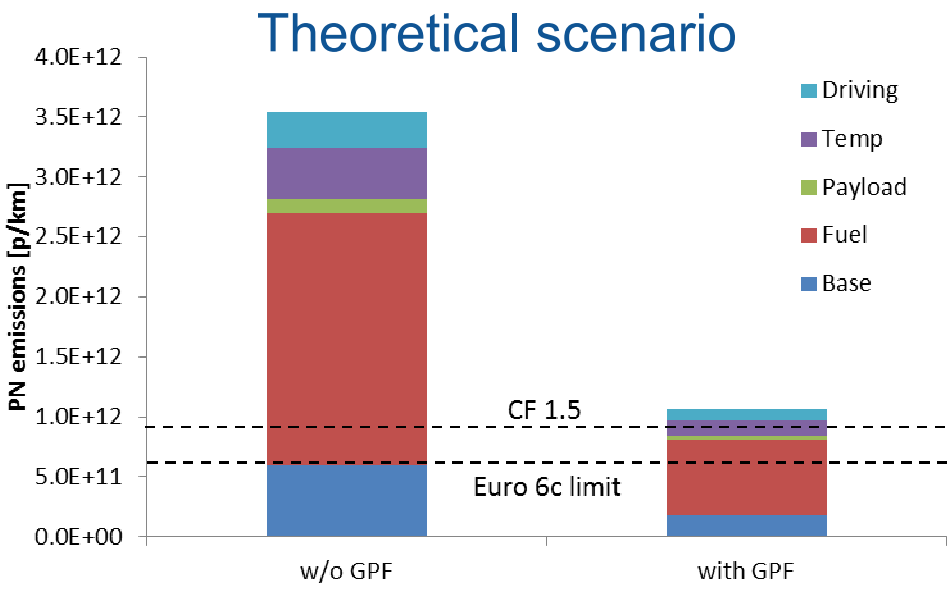
Fuel
Ambient temperature
Payload
Aggressive Driving

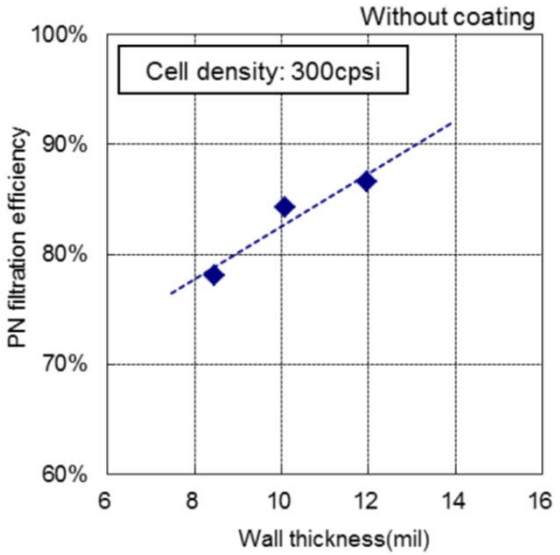


- Giechaskiel et al. 2015, Frontiers in Env. Sci. Air Pollution
- Riccobono et al. 2016
- ACEA/JAMA presentation

How low can PN from GDIs go in real life?

- Even with a Gasoline Particle Filter (GPF) these influences can amount to a significant contribution
- Care needs to be taken to have efficient GPFs
- Current practice suggests 60% efficiency, but can go up to 80% or even higher





PN-PEMS Measurement uncertainty

PN-PEMS vs	Theory	1 lab – many cars	1 car – many labs
PMP_TP	<25%	<35%	<40%
PMP_CVS	<50%	<50%	<55%
TP vs CVS (PMP)	<30%	<40%	<35%

Numbers are the worst case for all cases examined (i.e. they are max values) close to the EURO 6 PN limit

Proposal for PEMS-PN

Based on JRC Task Force work (2013-2016)

Inclusion of PN for RDE is technically feasible

Equipment fulfill the technical specifications and have shown good behaviour during extensive testing

Technology exists (GPF) that allows even GDIs to be significantly lower than the EURO 6 limits, but limits may be exceeded under the worst case scenario of RDE testing

Theory and the most extensive set of data available (JRC interlab and own tests) show that the uncertainty of measuring at the EURO 6 limit is 50%

- ***Margin for uncertainty of measurement set to 0.5 in 2017 for new types, in 2018 for all vehicles***
- ***With a review clause since equipment are bound to improve***

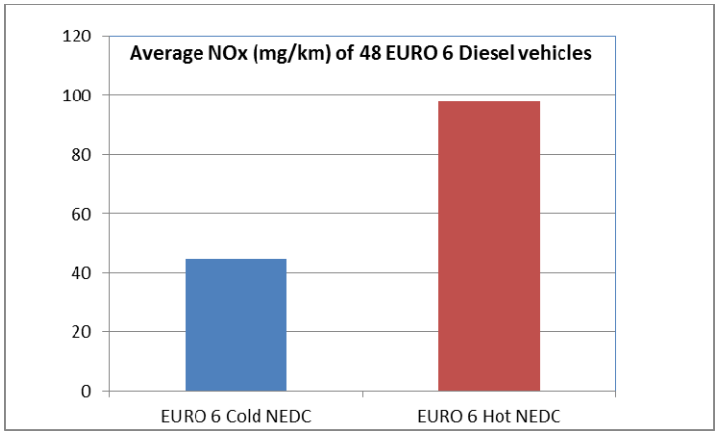
Cold Start Inclusion:

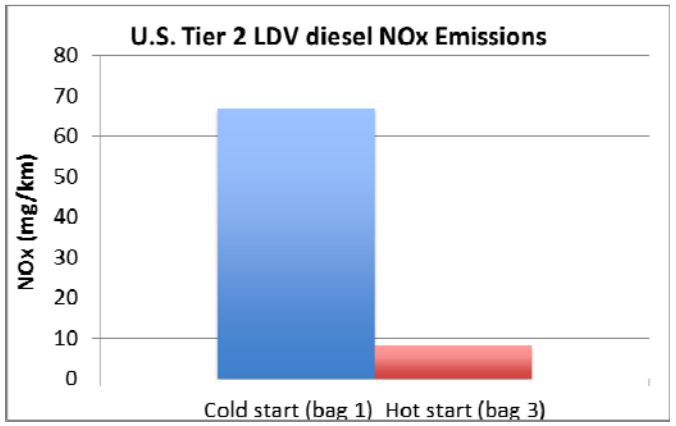
New Preconditioning and Boundary Conditions included

Start of evaluation from 1st sec with minimum preconditioning prescribed

Immediate inclusion into RDE

Introduction of a hot start RDE trip





How to avoid another dieselgate?

- *Guidance on the evaluation of Auxiliary Emission Strategies and the presence of defeat devices*
- *Stronger and more transparent Conformity of Production (in WLTP) and In-Service Conformity rules (coming in RDE4)*
- *Regular oversight and surveillance activities by MS, Commission (New Type Approval and Market Surveillance Proposal)*

Guidance on AES / BES and Defeat Devices

Stronger clauses for the approval of Auxiliary Emission Strategies (AES) in legislation

Complete with Guidance

Adopted on 26 January 2017 in Europe.

- **AES / BES approval details and methodology**
- **Testing for Defeat Devices**
- **Regularly updated**
- **Concrete examples**

Ref. Ares(2017)427612 - 26/01/2017

EUROPEAN COMMISSION

Brussels, 26.1.2017
C(2017) 352 final

COMMISSION NOTICE

of 26.1.2017

Guidance on the evaluation of Auxiliary Emission Strategies and the presence of Defeat Devices with regard to the application of Regulation (EC) No 715/2007 on type approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6)

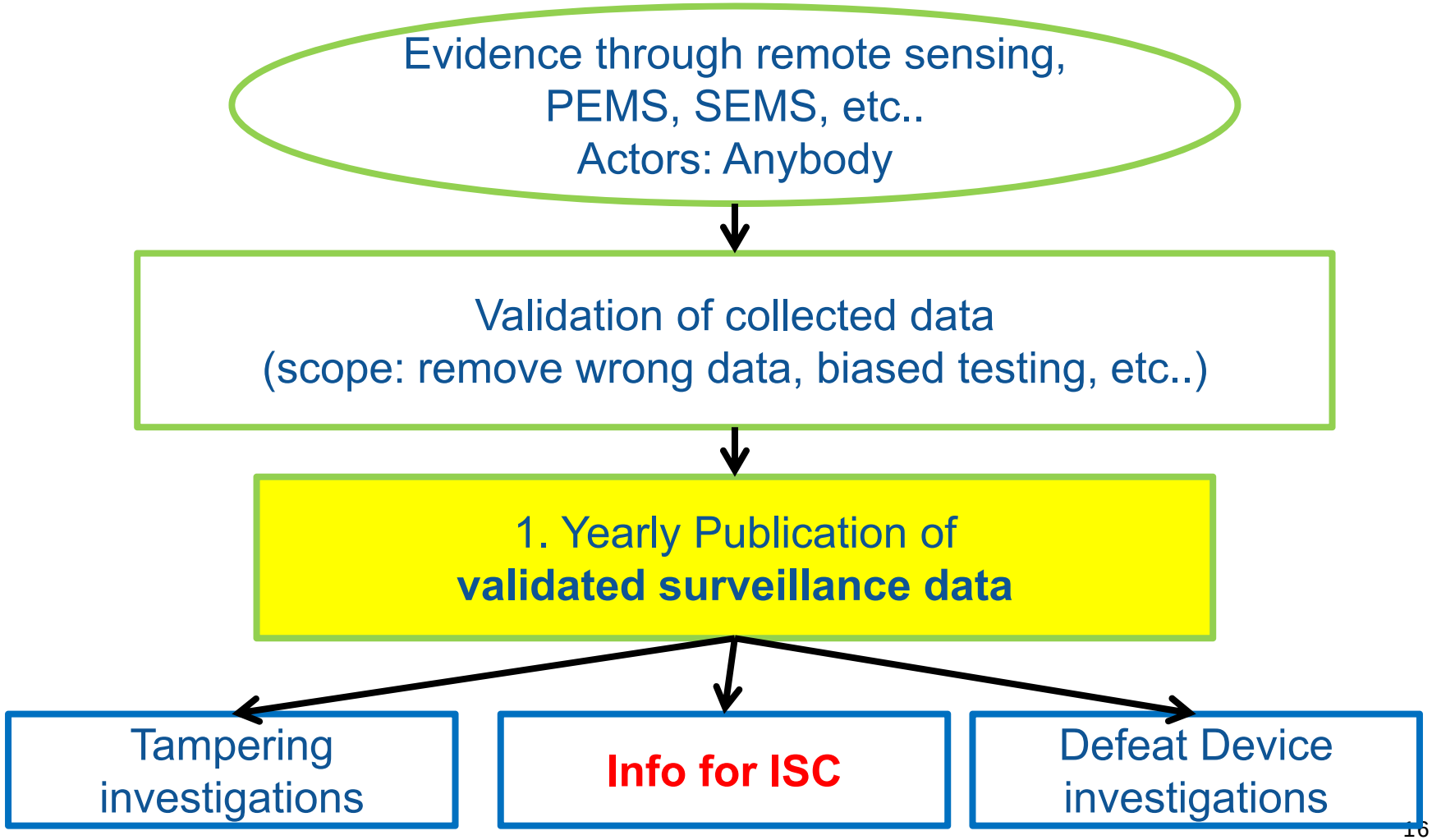
Issues in RDE 4

(currently in public consultation*)

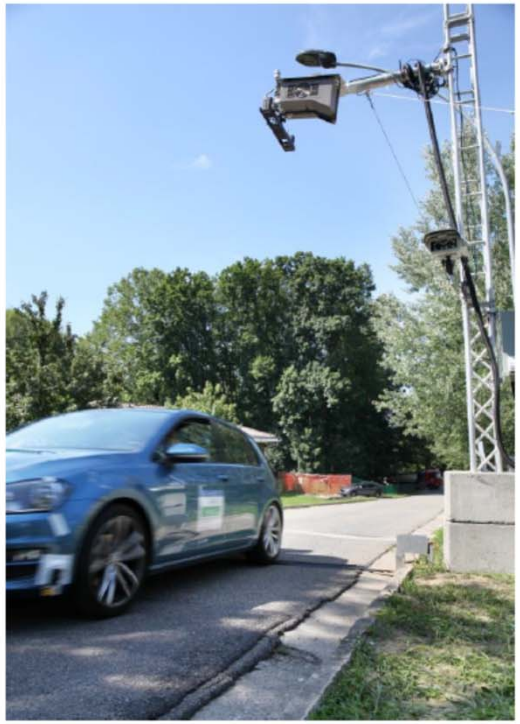
- *In-use compliance and independent testing*
- *Review procedure for Hybrids*
- *Review provisions for LCVs /multistage/ special purpose vehicles*
- *Review issue of heavy fuels and influence on PN emissions*
- *Review CFs*
- *Review evaluation methods*
- *Others..*

* http://ec.europa.eu/info/law/better-regulation/initiatives/ares-2018-1297632_en

Example of relevant info as input for ISC



What is a Remote Sensing Device?

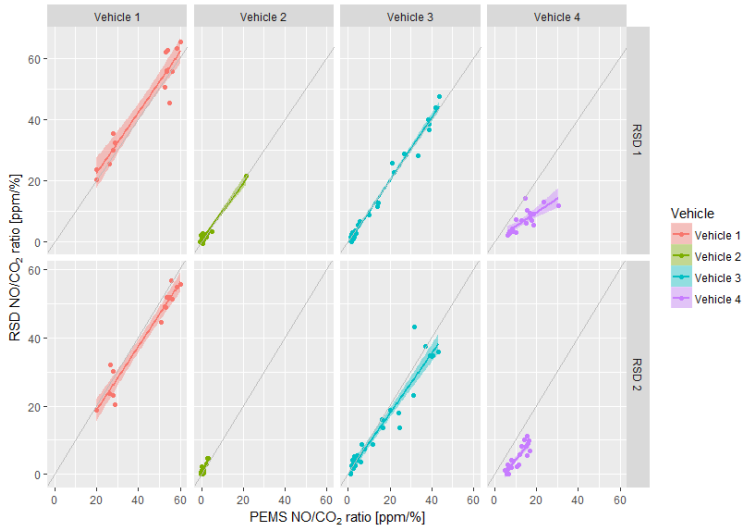


- Very effective method: few seconds of measurements and about 1 Euro per vehicle tested
- Compared to PEMS experiments: heavy instruments, modifications of the vehicle, 3 hours driving and at least 1 day prep. Cost:

Correlation between PEMS and Remote Sensing

Preliminary results by JRC show good correlation between instruments measuring on the vehicle (PEMS) and Remote Sensing.

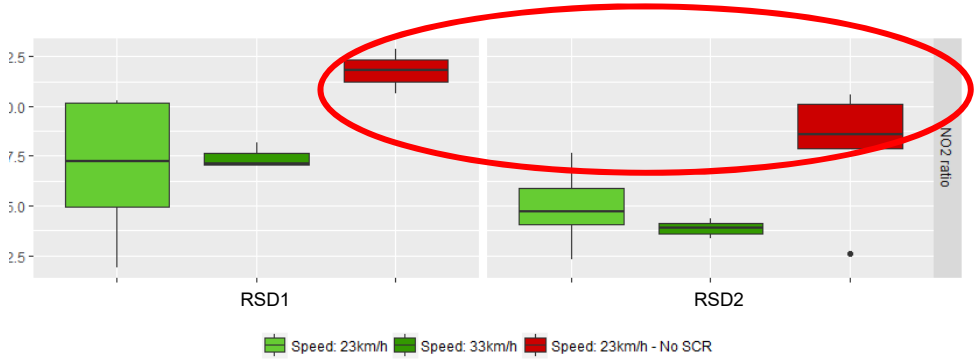
I.e. if a vehicle over-emits when measured with on-board instruments, it will show in remote sensing measurements as well



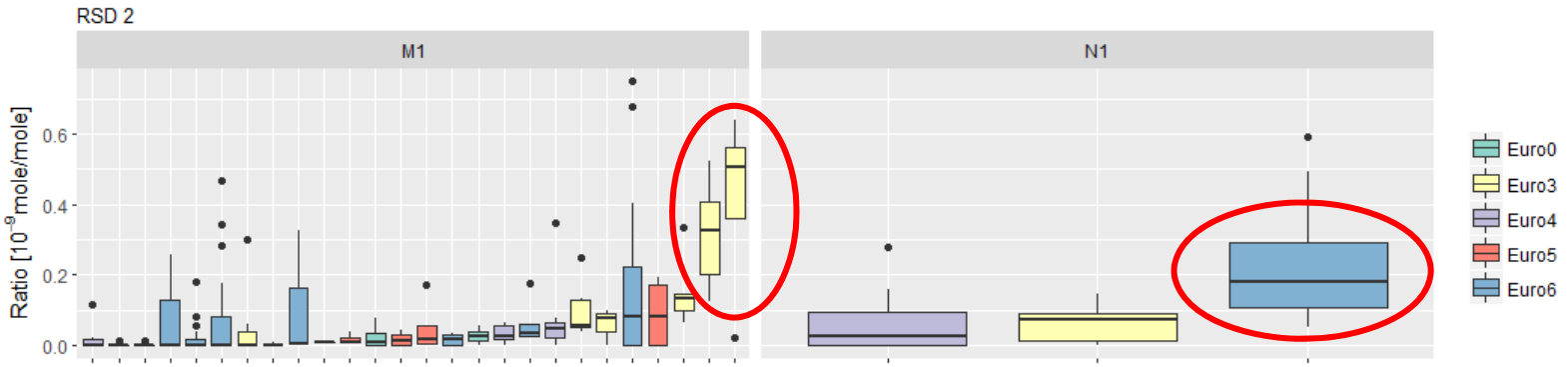
Important to set the **equivalent significant exceedance levels** correctly

Remote Sensing able to detect significant non-compliance:

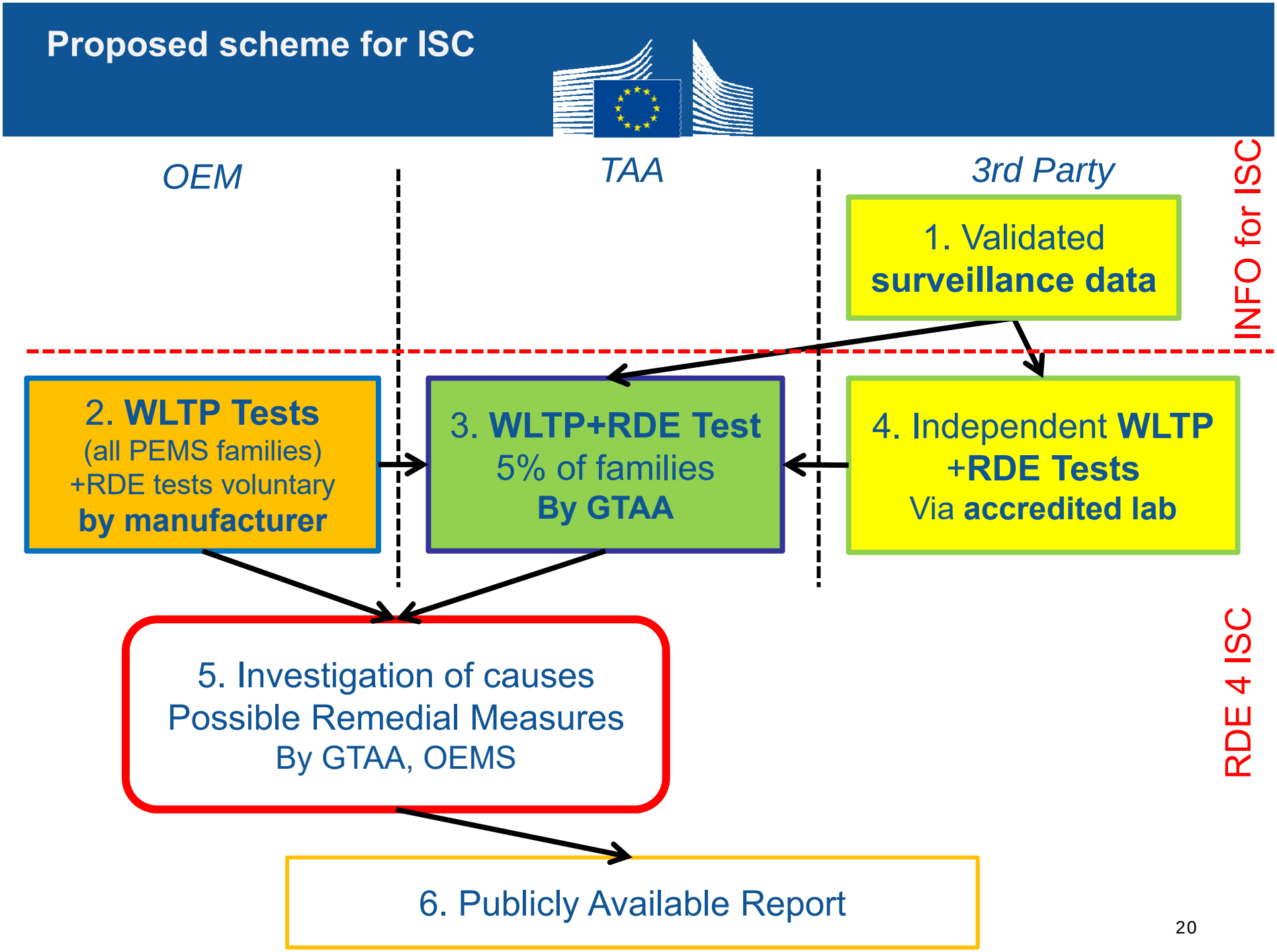
- Tampered SCR:



- Tampered DPF:



Proposed scheme for ISC



Introducing the WLTP/RDE into the EU emissions legislation

Gradual introduction:

Date	
7 July 2017	WLTP and RDE3 publication in European legislation
27 July 2017	WLTP/RDE3 in force
1st Sept 2017	WLTP, RDE NOx and PN Step1 NTE for new types
1st Sept 2018	WLTP and RDE PN Step1 NTE for all vehicles
1st Sept 2019	RDE NOx Step 1 and new evap test for all vehicles
1st January 2020	RDE NOx Step2 new types
1st January 2021	RDE NOx Step2 new vehicles

For the future:

- *RDE is a significant step towards acchieving full compliance with the spirit of the emissions regulation*
- *We now need to start building the future regulations*
- *Extensive study in 2019 with external consultants and the JRC*
- *Initial discussions started*
- *Meetings with stakeholders this summer*

Thank you for your attention!

Contact:

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