Elements for updating the ISC procedures

RDE-LDV Meeting of 9-10 March 2017
ISC for LDV in current legislation

In Regulation (EC) 715/2007:

Article 4.2:

• Manufacturers shall ensure that type approval procedures for verifying conformity of production, durability of pollution control devices and in-service conformity are met.

• In addition, the technical measures taken by the manufacturer must be such as to ensure that the tailpipe and evaporative emissions are effectively limited, pursuant to this Regulation, 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. Durability testing of pollution control devices undertaken for type approval shall cover 160 000 km. To comply with this durability test, the manufacturers should have the possibility to make use of test bench ageing, subject to the implementing measures referred to in paragraph 4.

• In-service conformity shall be checked, in particular, for tailpipe emissions as tested against emission limits set out in Annex I. In order to improve control of evaporative emissions and low ambient temperature emissions, the test procedures shall be reviewed by the Commission.
ISC for RDE only?

Initially idea was to change ISC only to include RDE, but several issues were raised:

• Responsibilities
• Testing burden
• Difficulties to find vehicles since the testing will be prolonged with RDE
• Appropriate statistical procedure
• Etc…

Need a holistic view to ISC to accommodate both WLTP and RDE

*(issue with ISC for CO₂ and Road Loads will be dealt with in UNECE WG)*
ISC for RDE

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

1. Information through independent testing with PEMS, SEMS, remote sensing, etc.
2. WLTC will be tested at the manufacturers for all PEMS families but RDE only voluntarily for the manufacturers
3. A certain % of PEMS families tested yearly via RDE at ISC under the responsibility of the granting TAA
4. Further independent RDE tests only via accredited labs/TS
5. Only granting TAA investigates further with manufacturer
6. Publicly available report
1. Example of relevant info for ISC

Evidence through remote sensing, PEMS, SEMS, etc..
Actors: Anybody

Validation of collected data
(scope: remove wrong data, biased testing, etc..)
(possibly through TAAEG subgroup on Market Surveillance)

1. Yearly Publication of validated surveillance data

- Tampering investigations
- Info for ISC
- Defeat Device investigations
New ISC procedure

2. WLTP Tests (all PEMS families) + RDE tests voluntary by manufacturer

3. WLTP+RDE Test % of families By GTAA By accredited lab

4. Independent WLTP + RDE Tests by accredited lab

5. Investigation of causes Possible Remedial Measures By GTAA, OEMS

6. Publicly Available Report
2. ISC with WLTP at the manufacturers

- Current system remains but the cycle now changes from NEDC to WLTC, on PEMS families, and change in statistical procedure
- Mostly under control of manufacturer as before

**2. WLTP Tests**
(all PEMS families)
+RDE tests voluntary
by manufacturer

Report all tests to GTAA

If sample fails with new statistical procedure, investigate
Test what?

- New definition of families as in PEMS-families
- Consequence: will double the number of families tested

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th># current ISC families</th>
<th># PEMS tests families</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer 1</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Manufacturer 2</td>
<td>26</td>
<td>38</td>
</tr>
<tr>
<td>Manufacturer 3</td>
<td>12</td>
<td>32</td>
</tr>
<tr>
<td>Manufacturer 4</td>
<td>13</td>
<td>31</td>
</tr>
<tr>
<td>Manufacturer 5</td>
<td>7</td>
<td>23</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>13.6</strong></td>
<td><strong>28.4</strong></td>
</tr>
</tbody>
</table>

*Note: Average is calculated by doubling the current ISC families.*
ISC statistics for RDE

- **Basic principles (from stakeholder input):**
  - Same statistics should be applied by all ISC actors
  - Sequential sampling, limit max. sample size (10 vehicles)
  - Variability of RDE tests naturally higher than NEDC/WLTP

- **Starting points:**
  - Modified NEDC statistics (ISO 8422:1991, Reg. ECE No. 83) [ACEA, ICCT]
  - Dutch statistics (adapted from WLTP CoP) [TNO, NL]
ISC statistics for RDE

Each proposal has pros/cons, both are not directly comparable

ISO 8422 statistics:
- Well-known framework
- Easy to apply (graphical method)
- Manufacturer/customer risk may need to be rebalanced (5%/10% in ISO 8422:2006)
- Separate treatment of outliers (two types; 1.5 and 2.5 thresholds)
ISC statistics for RDE

Each proposal has pros/cons, both are not directly comparable

Dutch statistics:

• More granular treatment of outliers (qualified via $S^2$ term)
• Fair "three strikes is out" principle
• Increased RDE variability may be unduly penalised (increased no. of ISC fails due to a small number of outliers)
• Integrated treatment of outliers (single procedure)
ISC statistics for RDE

Way forward: evaluate *modified* ISO 8422/ Dutch statistics via ISC process simulations (Excel)

- **ISO 8422**: Update pass/fail chart to conform to latest version of standard (addresses re-balancing or producer/customer risk) [between ACEA and ICCT proposals]
- **Dutch**: Incorporate "statistical margin" and/or slightly modified statistics to modulate sensitivity to outliers (median instead of mean, square of interquartile range instead of $S^2$)
- **JRC** to produce a working paper + Excel simulations within the end of the Month, circulated to all stakeholders in advance of April's meeting.
ISC statistics for RDE

Input requested: underlying PDFs for simulation

PDFs: Generalised beta distributions, \([a=2; b=5]\]

<table>
<thead>
<tr>
<th></th>
<th>PDF 1</th>
<th>PDF 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower/upper bound ([NTE])</td>
<td>0.5 / 2</td>
<td>0.3 / 1.5</td>
</tr>
<tr>
<td>% below NTE</td>
<td>65%</td>
<td>95%</td>
</tr>
<tr>
<td>Mean ([NTE])</td>
<td>0.93</td>
<td>0.64</td>
</tr>
<tr>
<td>St. dev ([NTE])</td>
<td>0.24</td>
<td>0.19</td>
</tr>
</tbody>
</table>
Part 3: GTAA testing

3. WLTP/RDE Test during ISC
   % of PEMS families
   Under the responsibility of GTAA

   GTAA source vehicles
   from general population
   based on risk assessment*

   Test 3-10 vehicles from the same
   PEMS family on WLTP/RDE
   Complete new statistics for sample
   Via accredited labs

   If sample fails,
   investigate

* Informed by surveillance data
New ISC-RDE procedure: Part 4: Independent Testing

4. Independent WLTP/RDE Tests for ISC by accredited tester
   (commissioned by other TAA, EC, OEMs, NGOs, regions, cities ...)
   *Pooling of tests permitted*

Tests 3 vehicles (up to 10 voluntary) from the same PEMS family*

Report to GTAA, OEM all tests (failed and passed)

If all 3 failed**: GTAA shall investigate
If less failed: GTAA shall complete statistics
If all pass: Family passes

*Informed by surveillance data
** if outliers already at first failed test
5. Investigation and 6. Reporting

- Investigate what caused the durability issue with OEM
- Was it really an issue or not?
- If yes, then OEM proposes, TA validates and OEM apply remedial measures
- Public report each year with results of ISC by TAA
Changes

- Changes in the system are significant, especially for granting TAA
  - Need to find vehicles
  - Need to fund accredited lab for a % of tests/year
  - Need to finish statistics for independent testing
  - Need to publish results
- Time is needed to assure adequate funds, access to vehicles, accredited labs availability, ….
- System starts immediately
- Voluntary for GTTA till 2021, mandatory afterwards
- In the intermediate period:
  - % of RDE performed by OEMS, until GTAA is ready
### Timing and responsibilities

<table>
<thead>
<tr>
<th>Reg.</th>
<th>Date</th>
<th>Vehicles</th>
<th>Types of ISC testing for OEMs</th>
<th>Types of ISC testing for TAA</th>
<th>Indep. Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>RDE 1-3</td>
<td>May 2017</td>
<td>All vehicles TA before RDE 4</td>
<td>WLTC by OEMs with current statistics</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>RDE 4</td>
<td>Sept 2018</td>
<td>First vehicles TA under RDE 4</td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Sept 2019</td>
<td>First vehicles TA under RDE 4 to be tested for ISC</td>
<td>WLTC for all PEMS families RDE for % of PEMS families (if GTAA not ready) &amp; voluntary for all</td>
<td>WLTC/RDE by GTAA for % of PEMS families (if ready)</td>
<td>Yes</td>
</tr>
<tr>
<td>2step RDE</td>
<td>Jan. 2020</td>
<td>Vehicles TA with lower CF for NOx</td>
<td>Same</td>
<td></td>
<td>Same</td>
</tr>
<tr>
<td>Mandatory ISC for TAA</td>
<td>Jan. 2021</td>
<td>Vehicles TA under RDE 4 to be tested:</td>
<td>WLTC by OEMs for all PEMS families (RDE voluntary)</td>
<td>WLTC/RDE by GTAA for % of PEMS families</td>
<td>Yes</td>
</tr>
</tbody>
</table>