Progress Report of World-wide Light-duty Test Cycle and Mode Construction

Prepared by WLTP-DHC/MCTF under GRPE/WLTP informal group

66th GRPE
6th/7th June. 2013
Palais des Nations, Geneva
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1. Progress since 65th GRPE

- **Cycle**
  - 15th DHC
    - Agreed to apply Ver5.1 (Vmax.< 120km/h)
    - Agreed cycle allocation
    - Proposed cycle profile modification (ver5.3) for Class 3 by India
  - 16th DHC
    - Finalized cycle profile for all classes (refer WLTP-DHC-16-06)
    - Discuss cycle allocation
  - 17th DHC
    - Discuss downscaling method
  - 18th DHC

- **Gerar shift**
  - Validation 2 Test
  - Confirmed well work
  - No major concern
  - Continue improvement
  - Final modification including downscale method

- **Mode Construction**
  - Work under MCTF
  - List up discussion points
  - Set proposals on several points
  - Still remain discussion points
  - Fixed (refer WLTP-DHC-17-04)

- **Technical Report**
  - 1st version
  - Under the development by JRC, Mr. Steven and JPN
  - Distribute draft version, Complete by Ad-hoc GRPE in Nov.
2. Cycle Profile

During 16\textsuperscript{th} DHC meeting, it was agreed to modify the cycle profile (Ver5.3 proposed by India) for Class3.

\(\rightarrow\) DHC has successfully developed the harmonized test cycles.

Specific time table of each cycle profile can be seen in WLTP-DHC-16-06 (UN web site)
During 18\textsuperscript{th} DHC meeting (Jun 2013), the following cycle allocation was agreed with adopting the downscale method.

*1) exempted as per CPs need

*2) downscaled cycle according to vehicle specification
3-2. Downscale Method

Please refer WLTP-DHC-18-04 for downscale procedure and WLTP-DHC-18-03 for its technical justification. Developed by Mr. Steven and Validated by mainly India.

Need to finalize the downscale calculation formula mainly by Mr. Steven, India and other CPs.
4. Mode Construction

During 16th DHC meeting (Mar 2013), the following mode construction was agreed (please refer WLTP-DHC-17-04 for more detail).
Mr. Steven has presented latest status of gear shift prescription (refer WLTP-DHC-16-03).

→ Validation 2 test indicated that this gear shift logic works well and no major concern was observed. Based on comments provided from participant laboratories, continue to work for improvement, then provide final version before starting confirmation testing.
## 6. Open Issues -1

### Cycle Development (a)

<table>
<thead>
<tr>
<th>Issues</th>
<th>Discussion points</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Deadline for submission of driving data</td>
<td>a) India and China requested deadline be extended to May</td>
<td>Decided to start development of new cycle after 8th DHC meeting. Later data submission is still open for analysis.</td>
</tr>
<tr>
<td>2. Regional Weighting when developing the WLTC</td>
<td>a) traffic volume</td>
<td>It was agreed to adopt the traffic volume ratio during the 8th DHC meeting</td>
</tr>
<tr>
<td></td>
<td>b) same weighting</td>
<td></td>
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<tr>
<td></td>
<td>c) compromised weighting</td>
<td></td>
</tr>
<tr>
<td>3. Threshold Speed for L/M/H</td>
<td>a) according to DHC-06-03</td>
<td>No threshold speed is applied</td>
</tr>
<tr>
<td></td>
<td>b) CP’s requirement</td>
<td></td>
</tr>
<tr>
<td>4. High Phase Cycle Construction (US&amp;EU versus other regions)</td>
<td>a) only ONE unified cycle</td>
<td>It was agreed to possess two (2) types of HIGH phase cycle during 7th meeting.</td>
</tr>
<tr>
<td></td>
<td>b) possess TWO types of High phase cycle</td>
<td></td>
</tr>
<tr>
<td>5. Mode Construction</td>
<td>a) cold start test only</td>
<td>Established Mode Construction Task Force (MCTF) for further discussion and agreed during 17th DHC meeting in Tokyo.</td>
</tr>
<tr>
<td></td>
<td>b) cold start &amp; hot soak start</td>
<td></td>
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</tbody>
</table>
## 6. Open Issues -2

### Cycle Development (b)

<table>
<thead>
<tr>
<th>Issues</th>
<th>Discussion points</th>
<th>Status</th>
</tr>
</thead>
</table>
| **6**  | Weighting Factor for L/M/H/Ex-H Phase | a) harmonized weighting factors  
b) permit regional weighting factors | Adopt harmonized weighting factors in Phase I gtr  
**Region or CP(s) may introduce regional WF based on traffic analysis** |
| **6**  | Gear Shift Points | a) fixed points  
b) based on vehicle specification  
c) others | Vehicle specific shift points (b) was provided for Validation 2. Still working on for improvement. |
| **8**  | How to treat the vehicles which are not able to follow the prescribed cycle | a) continue to drive with wide-open-throttle  
b) exempt the Ex-H (or M&H) phase (s)  
c) others | Apply downscale method. (Need to finalize the calculation formula for downscale ratio)  
(Ex-H exemption is per CP needs) |
| **9**  | Check the driving profile based on the vehicle characteristic | Analyze the in-use data based on vehicle characteristic (i.e. power to mass ratio) |
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## (66th GRPE, 6-7 June., 2013)

## 6. Open Issues - 3

### Mode Construction (a)

<table>
<thead>
<tr>
<th>OI L#</th>
<th>class</th>
<th>phase (s)</th>
<th>Points</th>
<th>how to close ?</th>
<th>Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>all</td>
<td>-</td>
<td>Power to Mass ratio threshold of classification curb mass or test mass ?</td>
<td>will be discussed during 15th DHC meeting based on Mr. Steven/Japan further study</td>
<td>apply kurb mass basis</td>
</tr>
<tr>
<td>2</td>
<td>all</td>
<td>-</td>
<td>definition of battery power and BEV maximum speed</td>
<td>JPN proposal : 30 minutes maximum power for Battery / 30 minutes maximum speed for BEV</td>
<td>All electrified vehicles belong to Class3</td>
</tr>
<tr>
<td>3</td>
<td>all</td>
<td>-</td>
<td>need &quot;HOT&quot; start test or not no clear position from CP</td>
<td>technical aspect : what kinds of criteria need to be established political : need input form CPs</td>
<td>not apply &quot;HOT&quot; start test</td>
</tr>
<tr>
<td>4</td>
<td>all</td>
<td>-</td>
<td>in case &quot;HOT&quot; start test is required, need COLD/HOT weighting factor</td>
<td>US/JP : already possess EU/IN/KR : conduct survey</td>
<td>na</td>
</tr>
<tr>
<td>5</td>
<td>all</td>
<td>-</td>
<td>in case &quot;HOT&quot; start test is required, need to define intermediate soak time.</td>
<td>US : 10 min. JPN : completely hot condition others : NA</td>
<td>na</td>
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<tr>
<td>6</td>
<td>all</td>
<td>L and/or M</td>
<td>in case &quot;HOT&quot; start test is required, which phase(S) need to be driven for HOT test ?</td>
<td>Vali1 : L, M (no need for H and Ex-H) confirm based on vali.2 results</td>
<td>na</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>all</td>
<td>vehicle speed threshold of cycle allocation -&gt;Equivalency of pollutants and CO2 value</td>
<td>need input mainly from India colleagues</td>
<td></td>
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<tr>
<td>8</td>
<td>2</td>
<td>all</td>
<td>vehicle speed threshold of cycle allocation -&gt;Equivalency of pollutants and CO2 value</td>
<td>need input mainly from India colleagues</td>
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<tr>
<td>9</td>
<td>3</td>
<td>all</td>
<td>vehicle speed threshold of cycle allocation -&gt;less than 120kph : provisionally accepted -&gt;ex-H phase driving : 135 or 145 or other ideas</td>
<td>will be discussed during 16th DHC meeting</td>
<td>Agreed during 16th DHC meeting (refer documents DHC-16-02)</td>
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11
## Mode Construction (b)

<table>
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<tr>
<th>OIL#</th>
<th>class</th>
<th>phase (s)</th>
<th>Points</th>
<th>how to close ?</th>
<th>Conclusions</th>
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</table>
| 10   | 2&3   | Ex-High   | Per CPs need, Ex-High phase driving is exempted.  
-> Equivalency of pollutants and CO2 value  
-> PM sampling  
-> Ki Factor (regeneration system)                                                                                      | JPN proposal : standalone test for Ex-High phase                                              | Will discuss at later stage                      |
| 11   | 2&3   | Ex-High   | Does low ambient temperature test require Ex-High phase driving or not ?                                                                 | so far, no discussion is done                                                               | Will discuss during Phase II                     |
| 12   | all   | all       | how to treat the vehicles whose maximum speed is less than phase maximum speed ?                                                                                              | [10]% merging constant speed, scale down profile, wide open throttle operation, exemption, ....  | Apply downscale method                           |
| 13   | samp ling strategy | all | PM : 1 filter sampling, however, need to consider OIL#7~10 other pollutants : reach phase sampling |                                                                                                                                                      | PM : 1 for L~H, 1 for Ex-H, Others : each phase |
| 14   | BEV   | all       | separate each phase test for range measurement is a burden for laboratories                                                                                                                  | confirm shorten method(proposed by JPN) works or not (->during confirmation test or E-Lab. unique program ?)  
if not, conduct each phase test separately  | 1 for L+M  
1 for L~ExH (or H)                                                                                                          |
| 15   | OVC-HEV | all     | separate each phase test for measurement is a huge burden for laboratories                                                                                                          | if no concrete counter-proposal is available, conduct each phase test separately          | 1 for L+M  
1 for L~ExH (or H)                                                                                                          |

Almost all open issues were successfully closed.
Development of a World-wide Harmonized Light-duty driving Test Cycle (WLTC)

Draft Technical Report

UN/ECE/WP.29/GRPE/WLTP-1G

DHC subgroup

XX. XX. 2013

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4. Japan Automobile Standards Internationalization Center (Japan, DHC Technical Secretary)
5. National Traffic Safety and Environment Laboratory (Japan, DHC Chair)

Refer WLTP-DHC-18-06 for latest report.
Final report will be completed by next ad-hoc GRPE (Nov. 2013)
### 8. Next Actions

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<td>16th DHC 65th GRPE</td>
<td>17th DHC 21&amp;22 in Tokyo</td>
<td>18th DHC 66th GRPE</td>
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<td><strong>Mode Construction Task Force</strong></td>
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<td>Close open issues for testing</td>
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<td><strong>Confirmation / Round-Robin test</strong></td>
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<td><strong>Related DTP activities</strong></td>
<td>12 DTP</td>
<td>13th DTP</td>
<td>14th DTP</td>
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- Reflect to gtr
- Ad-hoc GRPE
- Finalize gtr formal documents
- Final refine

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Thank you for all of your tremendous contributions on this difficult tasks !!!