Cycle / Gearshifting

Status report about the work of the task force on cycle and gearshift issues, amendment proposals for adoption

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Introduction

- **The remaining open issues were already presented to the IWG at its 18th meeting in Berne in the status report WLTP-18-05e rev1.**

- **At 02.05.2017 the chairman sent a revised version of the status report as TF paper WLTP-GSTF-32 rev1 together with excel sheets (calculation examples) and a text proposal for annex 2 of GTR #15 to the TF members.**

- **At 19.05.2017 the TF had a web-telco, in which the open issues were discussed.**

- **Those issues, where the group achieved consensus or almost consensus (some members asked for scrutiny reservations) are listed in this report as proposals for adoption by the IWG.**

Introduction

- **The others will be kept on the agenda for further consideration.**

- **This revision contains a modified proposal for Paragraph 2 (j), "Exclusion of a crawler gear", which resulted from discussions of the chairman with the task force member from Ford (Serve Ploumen).**

- **Although there was no time to discuss this within the task force, the chairman included these proposals in revision 1, because the requests from Ford are well justified.**

- **All modifications in this revision compared to the previous version are written in pink.**

Proposals for adoption by the IWG

- **Annex 2, further amendments for adoption by the IWG**

  1. **Paragraph 2 (g) of annex 2, Definition of n_{max},**

  2. **Paragraph 2 (h), $P_{wot}(n)$ as follow up of 1.,**

  3. **Paragraph 2 (i), determination of ng_{vmax},**

  4. **Paragraph 2 (j), exclusion of a crawler gear,**

  5. **Paragraph 3.3, Selection of possible gears with respect to engine speed, as follow up of 1.,**

  6. **Paragraph 3.5, Determination of possible gears to be used, as follow up of 1.,**

  7. **Paragraph 4, Additional requirements,**

     - ➢ **4 (a) modifications, add a new requirement 4 (g).**

Remaining open issues

- **4 (g) resulted from calculations performed within the preparation of the round robin test for calculation tools.**

- **Further issues, still under discussion or to be performed:**

  1. Downshifts during decelerations down to standstill,

  2. Round robin test for gearshift calculation tools.
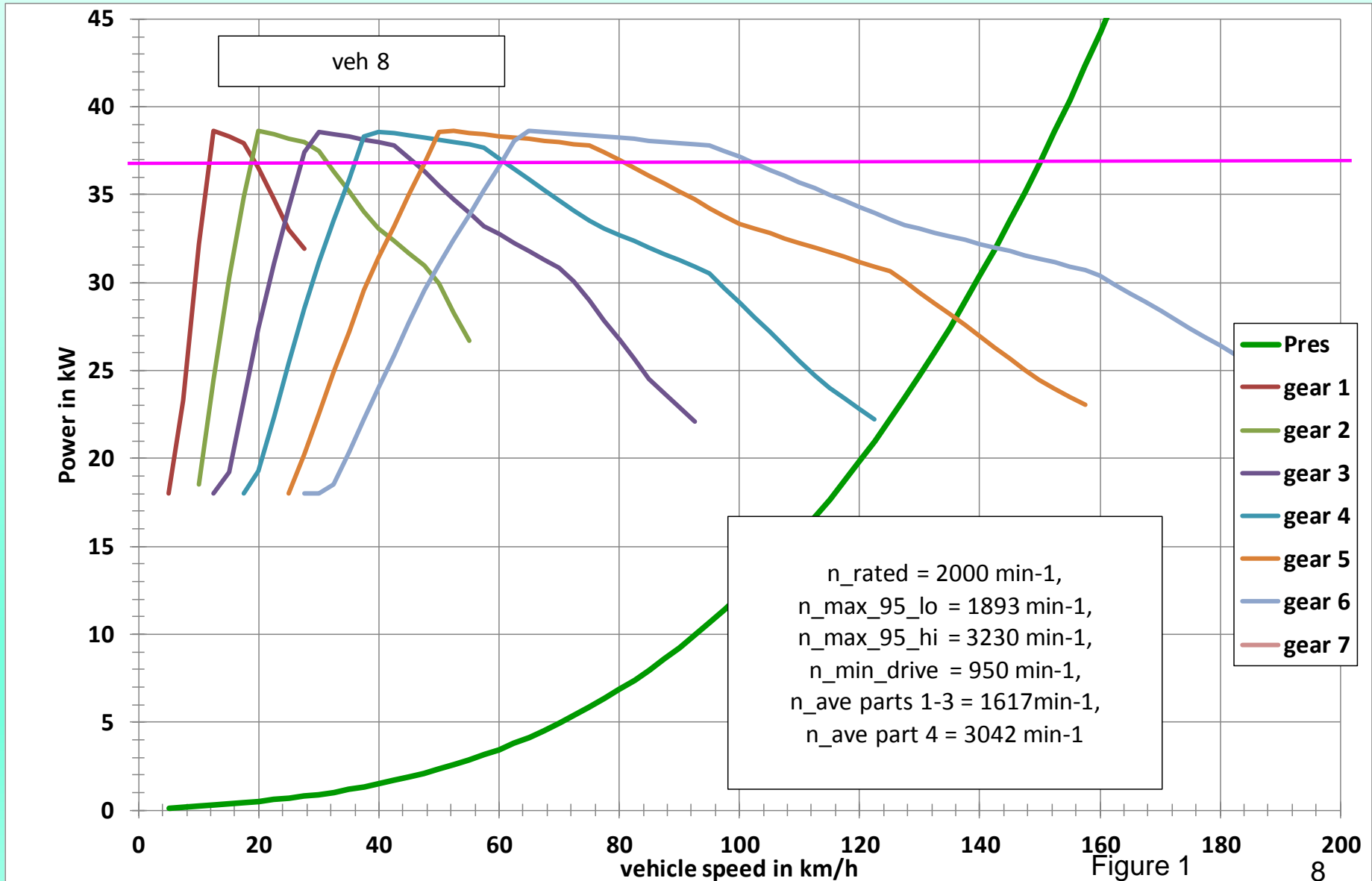
Paragraph 2 (g), Definition of n_{max}

- The Japanese colleagues provided 3 example vehicles for the round robin test of gearshift calculation tools.

- One of these examples (veh 8) could not correctly be calculated with the ACCESS tool (version 31.01.2017) because the design of the full load power curve led to a too low value for n_{max_95} (n_{95_low}).

- As a consequence the 2 second rule for acceleration phases (keep a given gear for at least 2 seconds) would lead to higher engine speeds than n_{95_low}.

- The vehicle has an extreme wot power curve with n_{rated} of 2000 min^{-1}, but a usable engine speed range up to 5000 min^{-1}. The vehicle speed at rated engine speed is 63,6 km/h, the engine speed at max. vehicle speed is 4480 min^{-1}.
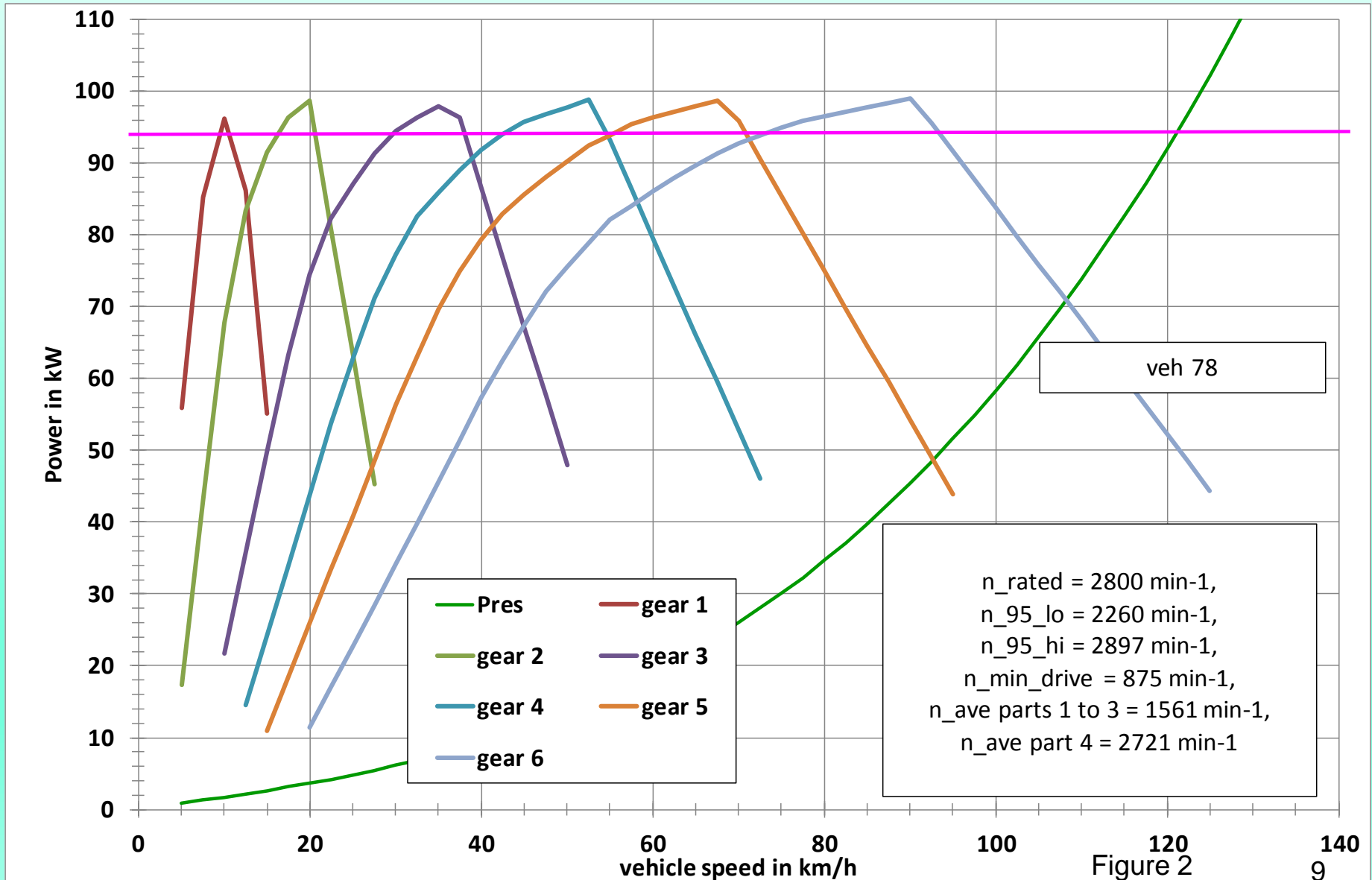
Paragraph 2 (g), Definition of n_{max}

- The available power for different gears and the required power for constant speed driving are shown in figure 1.

- n_{95_low} is 1893 min^{-1} (indicated by the pink line parallel to the x-axis); this leads to the fact that the 2. gear can only be used for just 1 second at t = 538 s and at t = 1030 s.

- A similar example is vehicle 78 (a N2 example provided by Japan), whose power curves are shown in figure 2. The 2. gear can only be used for just 1 second at t = 141 s, t = 515 s and t = 1030 s.

Available and required power vs speed

veh 8

n_rated = 2000 min-1,
n_max_95_lo = 1893 min-1,
n_max_95_hi = 3230 min-1,
n_min_drive = 950 min-1,
n_ave parts 1-3 = 1617min-1,
n_ave part 4 = 3042 min-1

Power in kW

vehicle speed in km/h

Figure 1

Pres
gear 1
gear 2
gear 3
gear 4
gear 5
gear 6
gear 7

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Available and required power vs speed

Figure 2

veh 78

n_rated = 2800 min-1,
n_95_lo = 2260 min-1,
n_95_hi = 2897 min-1,
n_min_drive = 875 min-1,
n_ave parts 1 to 3 = 1561 min-1,
n_ave part 4 = 2721 min-1

Legend:
- Pres
- gear 1
- gear 2
- gear 3
- gear 4
- gear 5
- gear 6

Y-axis: Power in kW
X-axis: vehicle speed in km/h

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- Both cases have an extreme high ratio between the engine speed $n_{max}(ng_{vmax})$ at maximum cycle speed in ng_{vmax} (the gear in which the maximum vehicle speed is reached) and n_{max_95}.

- This ratio is 2,18 for vehicle 8 and 1,80 for vehicle 78. Typical ratios for "normal" vehicles are between 0,65 and 1,25.

- Conclusion: A further requirement needs to be added to paragraph 2 (g) or the current requirements need to be replaced in order to solve this problem.

- The addition of a further requirement is not satifying, because this is then the 3rd time that n_{max_95} needs to be amended in order to eliminate contradictions with the 2 second rule.

Paragraph 2 (g), Definition of n_{max}

- The following examples make clear that it would be more appropriate to replace the current requirements by a better definition of n_{max_95}.

- Another option would be to skip n_{max} requirements completely.

- Figures 3 and 4 show the available power for all gears and the required power for constant speed driving for two other example vehicles with the same trans-mission design and almost the same wot power curve.

- The rated engine speed for vehicle 2 is at the upper end of the maximum power plateau (3500 min^{-1}) while the rated engine speed for vehicle 3 is at the lower end (2000 min^{-1}).
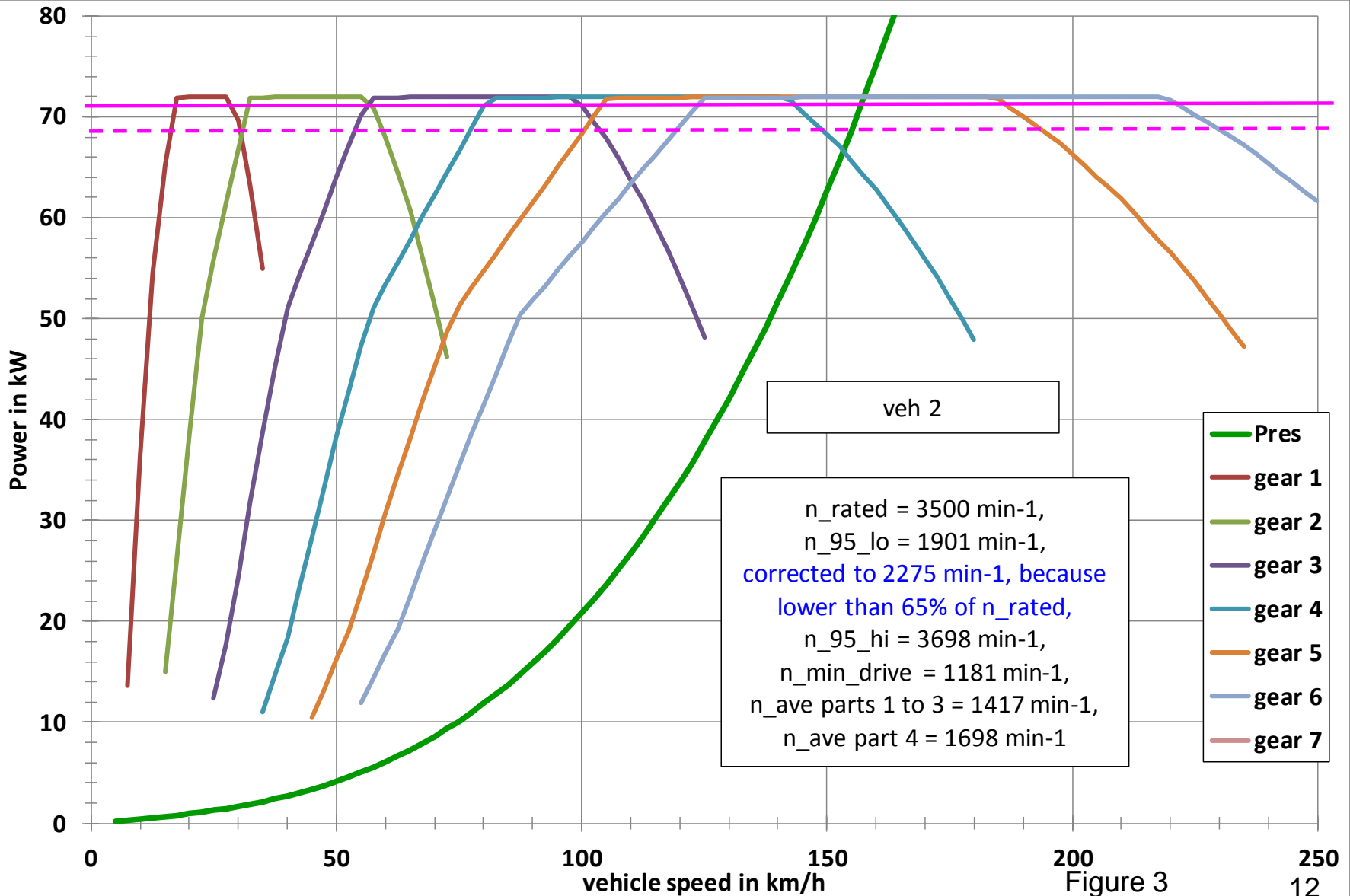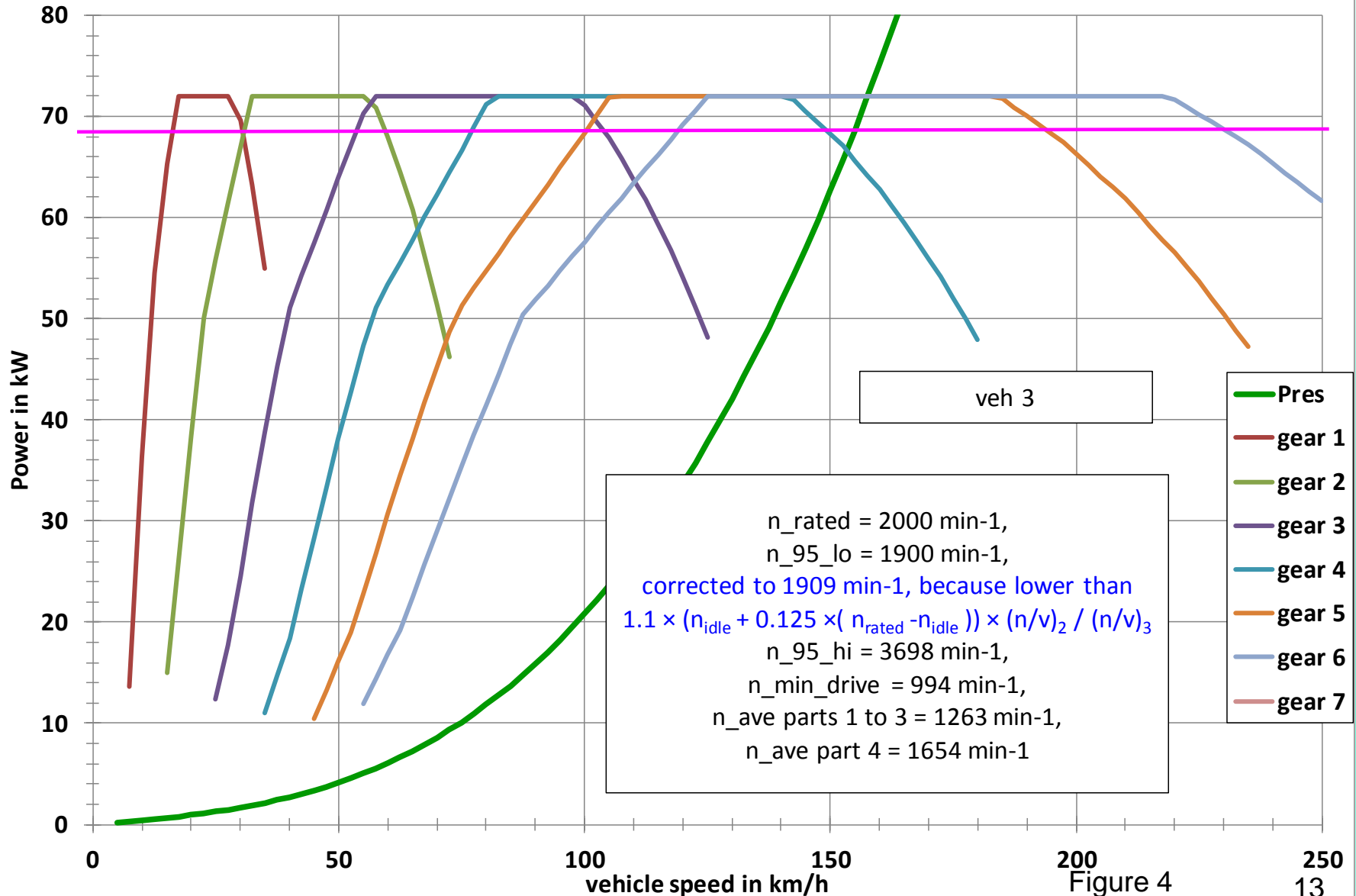
Available and required power vs speed

veh 2

n_rated = 3500 min-1,
n_95_lo = 1901 min-1,
corrected to 2275 min-1, because
lower than 65% of n_rated,
n_95_hi = 3698 min-1,
n_min_drive = 1181 min-1,
n_ave parts 1 to 3 = 1417 min-1,
n_ave part 4 = 1698 min-1

Legend:
- Pres
- gear 1
- gear 2
- gear 3
- gear 4
- gear 5
- gear 6
- gear 7

Power in kW (y-axis), vehicle speed in km/h (x-axis)

Figure 3

Available and required power vs speed

veh 3

$n\_rated = 2000$ min-1,
$n\_95\_lo = 1900$ min-1,
corrected to 1909 min-1, because lower than
$1.1 \times (n_{idle} + 0.125 \times (n_{rated} - n_{idle})) \times (n/v)_2 / (n/v)_3$
$n\_95\_hi = 3698$ min-1,
$n\_min\_drive = 994$ min-1,
n_ave parts 1 to 3 = 1263 min-1,
n_ave part 4 = 1654 min-1

Legend:
- **Pres**
- gear 1
- gear 2
- gear 3
- gear 4
- gear 5
- gear 6
- gear 7

Figure 4

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Paragraph 2 (g), Definition of n_{max}

- It is obvious that there will be no difference between both vehicles with respect to the driving behaviour in practical use. But the key values for the gearshift calculation are significantly different.

- n_{95_low} is 1900 min^{-1} in both cases. But 65% of rated engine speed is 2275 min^{-1} for vehicle 2 and 1300 min^{-1} for vehicle 3. n_{max_95} needs to be corrected according to para 2 (g) to 65% of rated engine speed (2275 min^{-1}) for vehicle 2 and to $1{,}1*n_{min\_drive}*(n/v)_2/(n/v)_3$ (1909 min^{-1}) for vehicle 3.

Paragraph 2 (g), Definition of n_{max}

- **Conclusion:**

  ➢ **The two additional requirements for n_{max_95}, which were already added in paragraph 2 (g) are obviously not sufficient to cover also such cases.**

  ➢ **A further requirement would need to be added to paragraph 2 (g) or the current requirements need to be replaced in order to solve this problem.**

- **Proposal for adoption by the IWG:**

  ➢ **Replace n_{max_95}, which is currently defined as n_{95_low}, by n_{95_high} and amend paragraph 2 (g) as shown in the following slides.**

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Paragraph 2 (g), Definition of n_{max}

(g) n_{max}

$n_{max1} = n_{95\_high,}$ the maximum engine speed where 95 per cent of rated power is reached, min $^{-1}$;

If n_{95_high} cannot be determined because the engine speed is limited to a lower value n_{lim} for all gears and the corresponding full load power is higher than 95 per cent of rated power, n_{95_high} shall be set to n_{lim}.

~~If n_{max_95} is less than 65 per cent of n_{rated}, n_{max_95} shall be set to 65 per cent of n_{rated};~~

~~If 65 per cent of $(n_{rated} \times (n/v)_3 / (n/v)_2) < 1.1 \times (n_{idle} + 0.125 \times (n_{rated} - n_{idle}))$, n_{max_95} shall be set to:~~

~~$1.1 \times (n_{idle} + 0.125 \times (n_{rated} - n_{idle})) \times (n/v)_2 / (n/v)_3$~~

~~$n_{max}(ng_{vmax}) = (n/v)(ng_{vmax}) \times v_{max,cycle}$~~

(g) n_{max} (continued, insert the highlighted text)

$n_{max2} = (n/v)(ng_{vmax}) \times v_{max,cycle}$,

$n_{max3} = (n/v)(ng_{vmax}) \times v_{max,vehicle}$),

where:

ng_{vmax} is defined in paragraph 2.(i) of this annex;

$v_{max,cycle}$ is the maximum speed of the vehicle speed trace according to Annex 1, km/h;

$v_{max,vehicle}$ is the maximum speed of the vehicle according to indent (i) of this paragraph, km/h;

$(n/v)(ng_{vmax})$ is the ratio obtained by dividing the engine speed n by the vehicle speed v for the gear ng_{vmax}, $min^{-1}/(km/h\ )$;

The last paragraph was moved from indent (h) to this place, because it belongs to the equation above and not to indent (h)

(g) n_{max} (continued, insert the highlighted text)

~~n_{max} is the maximum of n_{max_95} and $n_{max}(ng_{vmax})$, min^{-1}.~~

n_{max} is the maximum of n_{max1}, n_{max2} and n_{max3}, min^{-1}.

n_{max3} is needed for the calculation of ng_{vmax} and v_{max}.

This proposal would not only avoid conflicts with the 2 second rule but also improve the driveability for low powered vehicles.

Para 2 (h), $P_{wot}(n)$ as follow up of 1.

- **The modified specifications for n_{max} make the following modifications in Paragraph 2 (h), $P_{wot}(n)$ necessary:**

(h) $P_{wot}(n)$, the full load power curve over the engine speed range.

The power curve shall consist of a sufficient number of data sets (n, P_{wot}) so that the calculation of interim points between consecutive data sets can be performed by linear interpolation.

Deviation of the linear interpolation from the full load power curve according to Regulation No. 85 shall not exceed 2 per cent. The first data set shall be at n_{min_drive} of $n_{gear} > 2$ (see (k) below) or lower. The last data set shall be at ~~n_{rated} or~~ n_{max} or higher engine speed~~, or (n/v)(ng$_{vmax}$) × v$_{max}$, whichever is greater~~. Data sets need not be spaced equally.
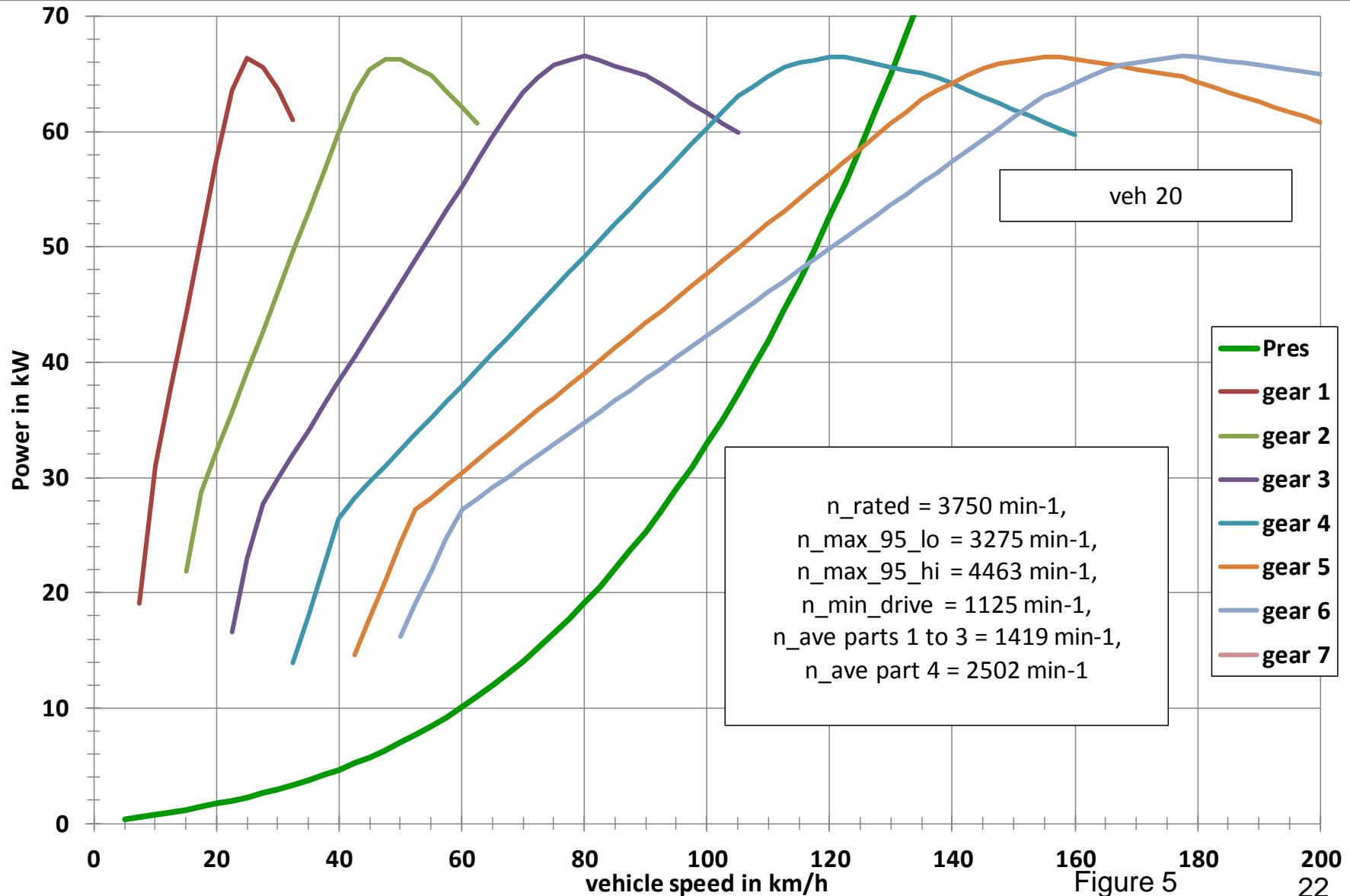
The full load power at engine speeds not covered by Regulation No. 85 shall be determined according to the method described in Regulation No. 85;

Para 2 (i), determination of ng_{vmax}

- One of the example vehicles for the RRT have a transmission design, so that the maximum vehicle speed is reached in gear ng-2 (see figure 5).

- This is not covered by the current specifications in paragraph 2 (i).

- In order to cover also gear ng-2 or even lower gears the text needs to be amended as shown in the following slides.

- This proposal is also intended for adoption by the IWG.

Available and required power vs speed

veh 20

n_rated = 3750 min-1,
n_max_95_lo = 3275 min-1,
n_max_95_hi = 4463 min-1,
n_min_drive = 1125 min-1,
n_ave parts 1 to 3 = 1419 min-1,
n_ave part 4 = 2502 min-1

Power in kW

vehicle speed in km/h

Pres
gear 1
gear 2
gear 3
gear 4
gear 5
gear 6
gear 7

Figure 5

(i)   Determination of ng_{vmax} and v_{max}

ng_{vmax}, the gear in which the maximum vehicle speed is reached and shall be determined as follows:

If $v_{max}(ng) \geq v_{max}(ng-1)$ and $v_{max}(ng-1) \geq v_{max}(ng-2)$ then,

$ng_{vmax} = ng$ and $v_{max} = v_{max}(ng)$,

If $v_{max}(ng) < v_{max}(ng-1)$ and , $v_{max}(ng-1) \geq v_{max}(ng-2)$ then,

$ng_{vmax} = ng-1$ and $v_{max} = v_{max}(ng-1)$,

otherwise, $ng_{vmax} = ng-2$ and $v_{max} = v_{max}(ng-2)$

where:

$v_{max}(ng)$ is the vehicle speed at which the required road load power equals   the available power P_{wot} in gear ng (see Figure A2/1a).

Para 2 (i), determination of ng_{vmax}

(i) Determination of ng_{vmax} and v_{max} (Continued)

v_{max}(ng-1) is the vehicle speed at which the required road load power equals the available power P_{wot} in the next lower gear (gear ng-1, see Figure A2/1b).

v_{max}(ng-2) is the vehicle speed at which the required road load power equals the available power P_{wot} in the gear ng-2.

Vehicle speed values rounded to one place of decimal shall be used for the determination of v_{max} and ng_{vmax}.

The required road load power, kW, shall be calculated using the following equation:

$$P_{required} = \frac{f_0 \times v_{max} + f_1 \times v_{max}^2 + f_2 \times v_{max}^3}{3600}$$

Para 2 (i), determination of ng$_{vmax}$

(i)   Determination of ng$_{vmax}$ and v$_{max}$ (Continued)

where:

v$_{max}$ is the vehicle speed, km/h.

The available power at vehicle speed v$_{max}$ in gear ng, ng-1 or gear ng-2 may be determined from the full load power curve, P$_{wot}$(n), by using the following equation:

$$n_{ng} = (n/v)_{ng} \times v_{max}(ng);$$

$$n_{ng-1} = (n/v)_{ng-1} \times v_{max}(ng-1);$$

$$n_{ng-2} = (n/v)_{ng-2} \times v_{max}(ng-2)$$

and by reducing the power values of the full load power curve by 10 per cent.

The above described method shall be extended to even lower gears ng-3, ng-4, etc, if necessary.

Para 2 (i), determination of ng$_{vmax}$

(i)   Determination of ng$_{vmax}$ and v$_{max}$ (Continued)

If, for the purpose of limiting maximum vehicle speed, the maximum engine speed ~~in the highest gear~~ is limited to n$_{lim}$ which is lower than the engine speed corresponding to the intersection of the road load power curve and the available power curve, then:

$$ng_{vmax} = ng_{max} \text{ and } v_{max} = n_{lim} / ((n/v) \times (ng_{max})).$$

The modifications resulted from calculations for example vehicles for the gearshift calculation round robin test.

Para 2 (j), exclusion of a crawler gear

- According to paragraph 2 (j), 5 conditions must be fulfilled in order to qualify the 1. gear as crawler gear and disregard it for the gear use calculation.

- Conditions 3 and 4 are as follows:

  (3) $(n/v)_1 \times v_{max} / n_{rated} > 7$

  (4) $(n/v)_2 \times v_{max} / n_{rated} > 4$

- The use of n_{rated} as calculation parameter could qualify vehicles with engines with extremely low n_{rated} values for a crawler gear although the transmission is not designed accordingly.

- This can be demonstrated for the vehicle shown in figure 4 (vehicle 3, n_{rated} = 2000 min^{-1}).

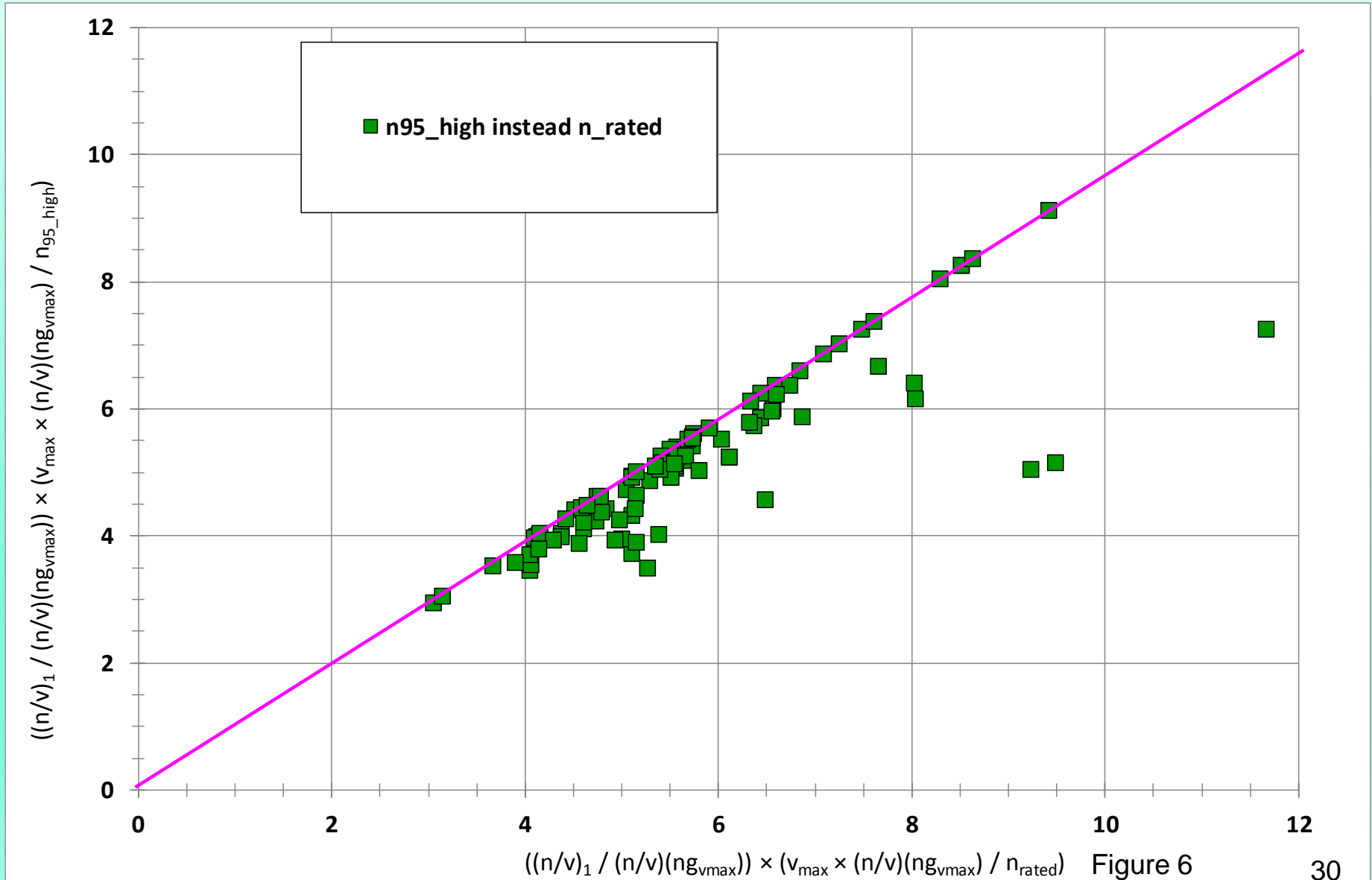# Para 2 (j), exclusion of a crawler gear

- The transmission design together with the extremely low n_{rated} value, leads to 9,5 for condition (3) and 4,87 for condition (4) for this vehicle.

- That means, this vehicle qualifies for a crawler gear with respect to conditions (3) and (4), but calculations for vehicle 3 with 1. gear as crawler gear led to driveability problems.

- The database contains 4 other vehicles, whose transmission design together with low rated engine speed values would fulfill the conditions (3) and (4).

- These vehicles would have driveability problems as well, if the 1. gear would be disregarded.

- Conclusion: n_{rated} is not a good parameter for the criteria (3) and (4).

Para 2 (j), exclusion of a crawler gear

- If n_{95_high} would be used for the calculation of the conditions (3) and (4) instead of n_{rated} the requirements would be improved significantly.

- But then, of course, the threshold values of 7 and 4 need to be adjusted.

- In order to find appropriate thresholds for n_{95_high}, the values resulting from the equations (3) and (4) in slide 27 were calculated for all vehicles in the database for the current situation as well as for the new proposal.

- The results for condition (3) are shown in figure 6, the results for condition (4) in figure 7.

Condition (3), new proposal vs current

Figure 6

Condition (4), new proposal vs current

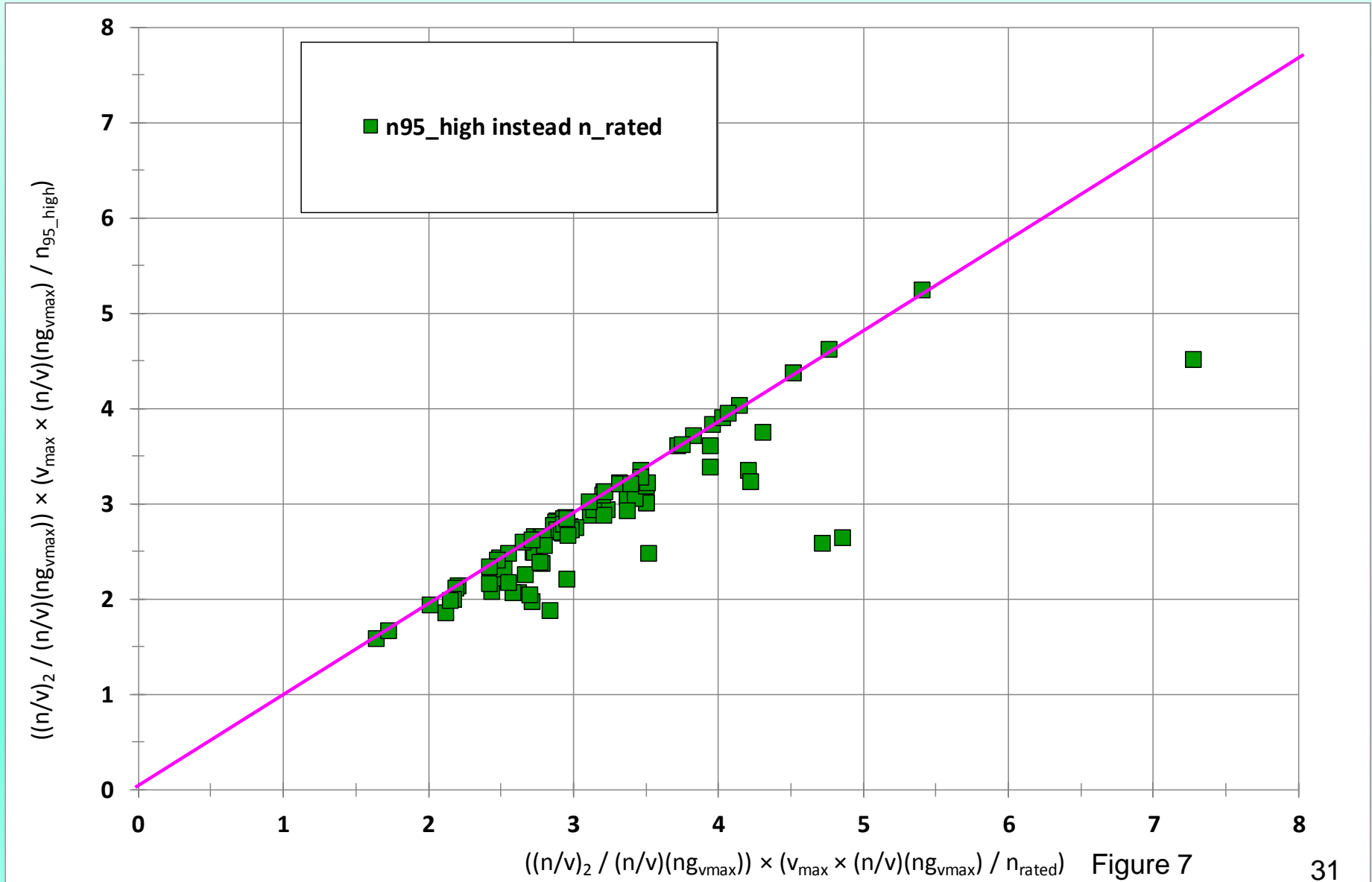Figure 7

Para 2 (j), exclusion of a crawler gear

- If one takes the pink curves as basis, the thresholds would be transformed to

  (3) 7 -> 6,74

  (4) 4 -> 3,85

- The database contains 8 other vehicles that would qualify for a crawler gear according to conditions (3) and (4), for the current condition as well as for the new proposal.

- None of these vehicles showed driveability problems, when the 1. gear was disregarded for the gear use calculation.

Para 2 (j), exclusion of a crawler gear

- **The task force member from Ford had scrutiny reservations with regard to v_{max} in both equations.**

- **It should be specified that v_{max} is determined by the intersection of the required road load power curve and the available power curve of the relevant gear, but not by an additional speed limiter.**

- **This is a justified request, because only these v_{max} values were used for the development of the conditions (3) and (4).**

- **In addition to that Ford asked for a deletion of condition (1), because it is not necessary.**

- **Condition (1) requires that the vehicle does not have a dual-range transmission.**

Para 2 (j), exclusion of a crawler gear

- **For a vehicle with a dual-range transmission only the range designed for normal on-road operation shall be considered for gear use determination (see paragraph 1.4 of annex 2).**

- **If in that range the 1. gear would qualify for a crawler gear, why should this not be considered?**

- **Although there was no time to discuss this within the task force, the chairman included these proposals in revision 1 because both requests are well justified.**

- **This leads to the following amendment proposal for paragraph 2 (j) for adoption by the IWG:**

Para 2 (j), exclusion of a crawler gear

(j)   Exclusion of a crawler gear

Gear 1 may be excluded at the request of the manufacturer if all of the following conditions are fulfilled:

~~(1)   The vehicle does not have a dual-range transmission;~~

(2)   The vehicle family is homologated to tow a trailer;

~~(3) $((n/v)_1 / (n/v)(ng_{vmax})) \times (v_{max} \times (n/v)(ng_{vmax}) / n_{rated}) > 7;$~~

(3) $(n/v)_1 \times (v_{max} / n_{95\_high}) > 6{,}74$

~~(4) $((n/v)_2 / (n/v)(ng_{vmax})) \times (v_{max} \times (n/v)(ng_{vmax}) / n_{rated}) > 4;$~~

(4) $(n/v)_2 \times (v_{max} / n_{95\_high}) > 3{,}85;$

(5)   The vehicle, ……….

(j)   Exclusion of a crawler gear (continued)

…………

where:

v_{max} is the maximum vehicle speed as specified in paragraph 2. (i) of this annex. But only the v_{max} value resulting from the intersection of the required road load power curve and the available power curve of the relevant gear shall be used for the conditions (3) and (4). v_{max} resulting from a limitation of the engine speed and prohibiting this intersection shall not be used.

Modifications in paragraphs 3.3 and 3.5

- The amendment proposal for n_{max} requires the following amendment proposals in paragraphs 3.3 and 3.5 for adoption by the IWG:

Modifications for paragraph 3.3

3.3. Selection of possible gears with respect to engine speed

The following gears may be selected for driving the speed trace at v_j:

(a) All gears $i < ng_{vmax}$ where $n_{min\_drive} \leq n_{i,j} \leq$ ~~n_{max_95}~~ n_{max1};

(b) All gears $i \geq ng_{vmax}$ where $n_{min\_drive} \leq n_{i,j} \leq$ ~~$n_{max}(ng_{vmax})$~~ n_{max2};

(c) Gear 1, if $n_{1,j} < n_{min\_drive}$.

If $a_j \leq 0$ and $n_{i,j} \leq n_{idle}$, $n_{i,j}$ shall be set to n_{idle} and the clutch shall be disengaged.

If $a_j > 0$ and $n_{i,j} \leq (1.15 \times n_{idle})$, $n_{i,j}$ shall be set to $(1.15 \times n_{idle})$ and the clutch shall be disengaged.

3.5. Determination of possible gears to be used

The possible gears to be used shall be determined by the following conditions:

(a) The conditions of paragraph 3.3. of this annex are fulfilled, and

(b) If $n_{i,j} \geq$ minimum engine speed of the P_{wot} curve (see paragraph 2 (h) of this annex), $P_{available\_i,j} \geq P_{required,j}$.

~~If in (b) $P_{available,i,j} \geq P_{required,j}$ can only be fulfilled in gear ng-1 when paragraph 3.3.(a) of this annex cannot be fulfilled because the corresponding engine speed exceeds n_{max_95}, this shall be accepted as long as the engine speed does not exceed n_{rated}.~~

~~If in (b) $P_{available,i,j} \geq P_{required,j}$ can only be fulfilled in a gear in which n_{rated} is exceeded, the next higher gear shall be used .~~

The yellow highlighted part is no longer necessary.

Amendment proposals for paragraph 4

- **The calculations performed during the preparation phase of the round robin text and for the further discussions in the TF led also to the following amendment proposals for paragraph 4, "Additional requirements for corrections and/or modifications of gear use".**

- **The following amendments should be made in indent (a) in order to make the whole procedure more logical and to improve the calculation result.**

- **Paragraph 4 (a) should start with the following correction, that is in principle already contained in indent (c), but should be performed as first step:**

Amendment proposals for paragraph 4

- If a one step higher gear (n+1) is only required for just 1 second and the gears before and after are the same (n), gear n+1 shall be corrected to gear n.

- **The following section (currently the first section in indent (a) should be amended as follows:**

- If a one step lower gear is required at a higher vehicle speed during an acceleration phase for more than 1 second, the higher gears before shall be corrected to the lower gear. This correction shall not be performed for gear 1.

- If a one step lower gear (n-1) is only required for just 1 second during an acceleration phase and the gears before and after are the same (n) or higher, gear n-1 shall be corrected to gear n.

Amendment proposals for paragraph 4

- **The lack of power for just one second, that would require a one step lower gear, would not lead to driveability problems and thus not justify the correction of the gear use in the previous part of the acceleration phase.**

- **If the lack of power for just one second would require a two steps lower gear (such cases occured during the calculations), the gear use should be corrected as follows:**

- If a two steps lower gear is required at a higher vehicle speed during an acceleration phase for just 1 second, this gear and the higher gears before shall be corrected to a one step lower gear. This correction shall not be performed for gear 1.

Amendment proposals for paragraph 4

- **The amendment proposal for indent (a) is also intended to be adopted by the IWG and is summarised in the following slide.**

(a)   If a one step higher gear (n+1) is only required for just 1 second and the gears before and after are the same (n), gear n+1 shall be corrected to gear n.

If a one step lower gear is required at a higher vehicle speed during an acceleration phase for more than 1 second, the higher gears before shall be corrected to the lower gear. This correction shall not be performed for gear 1.

Example: $v_j < v_{j+1} < v_{j+2} < v_{j+3} < v_{j+4} < v_{j+5} < v_{j+6}$. The original calculated gear use is 2, 3, 3, 3, 2, 2, 3. In this case the gear use shall be corrected to 2, 2, 2, 2, 2, 2, 3.

If a one step lower gear (n-1) is only required for just 1 second during an acceleration phase and the gears before and after are the same (n) or higher, gear n-1 shall be corrected to gear n.

Example: $v_{j-1} < v_j < v_{j+1}$. The original calculated gear use is 5, 4, 5 or 5, 4, 6. In this case the gear use shall be corrected to 5, 5, 5 or 5, 5, 6.

If a two steps lower gear is required at a higher vehicle speed during an acceleration phase for just 1 second, this gear and the higher gears before shall be corrected to a one step lower gear. This correction shall not be performed for gear 1.

Add a new indent (g) in paragraph 4

- As already mentioned, the example vehicle shown in figure 5 has an extreme transmission design, where the two highest gears of this 6speed transmission are designed as "overdrives", so that the maximum vehicle speed is reached in 4th gear.

- In this case an upshift to a higher gear could occur at the transition from an acceleration or constant speed phase to a deceleration phase, which is not in line with practical use but not prohibited by the current prescriptions in annex 2.

- This is also the case for 4 of the example vehicles for the RRT.

- This proposal is intended to avoid unjustified upshifts for adoption by the IWG.

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Add a new indent (g) in paragraph 4

- **In order to avoid normally unlikely upshifts during the transition from an acceleration or a constant speed phase to a deceleration phase, the following new indent (g) should be added to paragraph 4.**

(g)   No upshift to a higher gear at the transition from an acceleration or constant speed phase to a deceleration phase, if the gear in the phase following the deceleration phase is lower than the upshifted gear.

Example: If $vi <= vi+1$ and $vi+2 < vi+1$ and gear $i = 4$ and gear $i+1 = 5$ and gear_$i+2 = 5$, then gear_$i+1$ and gear_$i+2$ shall be set to 4, if the gear for the phase following the deceleration phase is gear 4 or lower. For all following cycle trace points with gear $= 5$ within the deceleration phase the gear shall also be set to 4. If the gear following the deceleration phase is gear 5, the upshift shall be done.

If there is an upshift during the transition and the initial deceleration phase by 2 gears, an upshift by 1 gear shall be performed.

Amended version of GTR #15

- **The previous amendment proposals are also incorporated in the Word document below.**

Microsoft
Word-Dokument

Downshifts during decelerations down to standstill

- At 05.04.2017 Nick Ichikawa made the following amendment proposal for deceleration phases down to standstill:

- It is allowed to set higher n_{min_drive} than defined in paragraph 2 (k) indent (c) of Annex 2. The aim is to improve drivability by excluding the low engine speed with high load. It's obvious that this option is designed for acceleration, not for deceleration.

- Since no drivability problem is observed during deceleration, it is more representative to keep the original n_{min_drive} definition during deceleration in any cases.

- This proposal was sent to the GSTF and was discussed in the web-telco at 19.05.2017.

Downshifts during decelerations down to standstill

- The outcome of the discussion can be summarised as follows:

- The current prescriptions in paragraph 2 (k) allow manufacturers to use higher values for gears > 2 than the default, which is defined by the following equation:

$$n_{min\_drive} = n_{idle} + 0.125 \times (n_{rated} - n_{idle})$$

- The TF proposes that the manufacturer may specify higher values, but different for acceleration and constant speed phases on one side and deceleration phases on the other side.

Downshifts during decelerations down to standstill

- **Since there was not enough time left to assess this proposal with respect to possibly necessary limitations or to possible conflicts with other gearshift specifications, it is not yet ready for adoption by the IWG and will therefore be further considered in the TF.**

Round Robin tests for GS calculation tools

- At IWG #16 Christoph Lueginger proposed a round robin test for gearshift calculation tools in order to check the tools as well as the common understanding of the text in annex 2.

- The chairman asked the TF members to provide input data of example vehicles for this exercise.

- The deadline for the delivery was set to end of March.

- Meanwhile datasets of 22 example vehicles were provided by 3 OEMs and JARI. 4 of these vehicles have variants with speed caps or ASM.

- The chairman added 6 vehicles intended to cover the whole variation ranges of technical design parameters (e.g. different vehicle classes).

Round Robin tests for GS calculation tools

- It is recommended to wait for the adoption of the proposed amendments by the IWG and then amend the ACCESS tool accordingly, before the start of the round robin test.

- Once the ACCESS calculation tool has been amended, the amended tool and the example vehicles will be distributed to those participants that use own calculation tools and the RRT will be started.

- The results of the calculations with the different tools will then be collected and compared.

Amendments in the ACCESS tool

- **Meanwhile, EVAP purge cycles were added to the ACCESS calculation tool.**

End

Thank you for your attention!