Meeting Minutes
15th Meeting
Informal Group on Gaseous Fuelled Vehicles (GFV)
27th September 2011
Brey Building
10.00-17.00

I. WELCOME & INTRODUCTIONS

II. APPROVAL OF THE MINUTES OF GFV-14

1. No comments or changes were made to the minutes of the previous meeting.

III. APPROVAL OF THE AGENDA

2. Agenda was adopted with no comments or changes

IV. LNG TASK FORCE REPORT

3. Brief update report by Jeff Seisler (co-secretariat) with Jaime Del Alamo (co-secretariat) of the LNG Task Force. The key issues discussed at the meeting held on 7 September 2011 (Brussels) were:

1) Whether a completely new draft of an LNG regulation should be created or whether R.110 would be modified;

2) How to manage the timing of proposed LNG amendments to R.110 with the timing of the adoption of the ISO LNG standard 12991 (TransportableTanks for use on board vehicles) and other ISO LNG standards that will be used as models for the amendments incorporated into R.110;

3) Specific issues that would have to be considered specific to LNG such as temperature and pressure differences required by vehicles and at fuelling stations.

The decision was made to amend the existing R.110 and include the terms for LNG within the language for CNG wherever it was 'simple' and appropriate. Where major differences for LNG were identified, such as testing specific components, these would have to be put into a completely new Annex. The task force then went through the R.110 document line-by-line to make appropriate LNG amendments.

4. Comment by Mr. Rijnders: The Hydrogen GTR currently being prepared might be useful in viewing and comparing the provisions for LNG testing as well as other issues such as venting. Both standards may deal similarly with cryogenic fuel issues.

5. Mr. Rijnders indicates that Chairman Dijkhof will not be at the GRSG to report the results of the LNG Task Force meeting and asks whether one of the co-secretariats or a suitable replacement can be present at the next meeting to make a full but brief report.

V. GFV OVERVIEW OF ALL DEFINITIONS RELATED TO GASEOUS FUELLED VEHICLES (REQUEST FROM WLTP)

6. NGV Global provided a brief document (GFV-15-04 – NGV Terminology) that addressed definitions of vehicles (bi-fuel, dual fuel, etc.) used by different countries, regulatory and legislative bodies. Mr. Rijnders asked if someone from AEGPL and NGV industry associations (NGV Global and/or NGVA Europe) can collect definitions that are more

specifically associated with the work being done by the WLTP, which is more in line with the UN/ECE work specifically. But there also is interest in seeing definitions in legislation from different countries; (Europe; India, and other UNECE countries). The definitions should relate to emissions, OEM light duty vehicles.

7. NGVA Europe indicated that they can look at the various gaseous fuel definitions in accordance with the working being done by WLTP. AEGPL indicated they would gather definitions as well. Mr. Rijnders said that the first draft of the definitions document should be done by the end of October 2011 to be distributed to the GFV group.
8. Directive 750/2007 in the CO2 legislation has a set of definitions and should be referenced.
9. Bill Coleman (VW) is doing a search for definitions for WLTP. He should be contacted in order to coordinate the collection of information that will be gathered.

VI. CH4 correlation factor (Cummins)

10. Mr. Rijnders raised the issue that there needs to be a correlation between the different testing cycles for the gas engines. TNO has done some work on correlation factors
11. Peter Williams (Cummins) submitted a document about the correlation factor to the Dual-Fuel Task force consideration but the discussion it was that the issue be dealt with by the GFV because it is not limited to dual-fuel engines. (But it is necessary for dual-fuel engines to develop a correlation factor)
12. Mr. Dekker, (TNO). The main issue was the NOx of diesel engines and there is insufficient data, also because the cycles were changed. For example, there was no discussion about the correlation factors between cold start and hot start. A calculation-based correlation must be done using engine data and the average load factors between the WHTC and ETC cycles. Also selective catalytic reduction (SCR) systems were included in the data but they, like other engine types, all have their own different behaviors in the testing process and this complicates the correlation.
13. Mr. Rijnders asked that the discussion on the correlation factor be scheduled for the next GFV meeting and Mr. Williams can present the Cummins position. Mr. Rijnders requested that the document (PowerPoint presentation) be included in the minutes of the GFV-15 meeting.

VII. REQUEST FROM COMMISSION ON CH4/THC LIMIT

14. The industry has, for a long time, advocated the use of an NMHC for light duty NGVs and not include a THC standard. An alternative approach is being developed by the Commission is to look at methane emissions as a CO2 equivalent. The Commission believes the issue can be dealt with in the comitology process, potentially to be completed by 2013. The Commission requested input from the NGV industry stakeholders to determine if a methane cap or THC should be used in the proposed regulation and if so, at what levels.
15. Mr. Martinez (DG Environment). They are looking to see if the THC can be removed from Euro 6 for NGVs. Some comments are made from the group that attributing methane as a CO2 equivalent could contribute only a few grams more than the petrol vehicle CO2 levels and will not affect the OEMs attempts to reach 130g/km level and below.) But NGVs could have a benefit to the environment if more were made to lower the OEM CO2 vehicle output.
16. NGV Europe has requested data from some of the OEMs and conversion system companies. NGV Global also has requested data from some of the conversion suppliers. The two groups are searching for data to indicate what appropriate limit values might be for methane/THC.

17. Landi Renzo and others indicate that this is not just an OEM issue because all the conversion systems will be tested under R.115 with the most current emissions regulations levels.
18. Mr. Rijnders agrees this is not only an OEM issue. Retrofit systems have not yet factored methane as a CO2 equivalent and such analysis should help done to confirm the claims. The most critical factor is the NMHC. The question then is, if methane is considered as a GHG, and there is a NMHC covering the more potent emissions, why then would a methane cap or THC be needed?
19. DG Enterprise is taking these arguments on board and now the industry should provide data. Question for the Commission is: What form of the proposal or data do they want? A position paper is needed.
20. NGV Global has made an issue paper on NMHC in the past and this can be referenced separately to the Commission.
21. A proposal within the context of Euro 5/6 is needed with a justification as to what is being advocated, using specific data to support the argument, probably as an Annex. The audience for the document is the Commission so they can use it as part of their political advocacy with the Parliament/Council.
22. TNO has done a number of studies in the past and should have a data base, but much of this was done in Euro 4.
23. AEB indicates that the methane and non-methane emissions components between gasoline and NGVs are similar. When methane is factored it is less than 1% of the total gasoline CO2 output.
24. There is a question as to who in the Commission is managing this issue: The Commission indicates that the competency is in DG Enterprise but DG Climate and DG Environment will be consulted.
25. A proposal, basically an amendment to Euro 5/6, must be done (with appropriate references to other documents and using newly generated data). Suzanne Leifheit was asked if she (VW) can create a first draft proposal for an amendment. The question comes up, however, if the OEM perspective and retrofit perspective coincides. As long as the concept is to do away with the THC, in favor of an NMHC as well as a value limit for methane as a CO2 equivalent, both OEMs and retrofit system suppliers should be able to agree on this approach. Another issue is that methane is legislated as a pollutant and not a greenhouse gas. The proposal will not include a 'methane cap.' A NMHC limit value as a 'pollutant' and methane as a CO2 equivalent will be the focus. Suzanne Leifheit will work internally with Bill Coleman and be in contact with Mr. Rijnders to further make a formal proposal and in which regulation that the proposal would be best (R.101 or R.83).
26. NGV Global expresses two concerns: 1) can the data that has been requested be turned over to the authors of the proposal – yes; and 2) There is concern that the proposal is used as a basis for OEM vehicles and that the retrofit industry might still suffer since the OEM emission levels achieved also include a methane catalyst. We would not want, for instance, Euro 6 vehicles to be excluded from R.115.
27. Mr. Rijnders indicates that Euro 6 might be too stringent for retrofit vehicles, but this remains to be seen.
28. AEGPL indicates that if the principal is accepted for Euro 6 then this could be adapted/adopted for R.115. But it is important now to get the principal adopted.
29. Mr. Rijnders indicates that we have to complete the proposal as quickly as possible to be provided to the Commission in January.
30. TNO has data on 53 cars from Euro 4 that shows some 15% CO2 reduction.

VIII. DUAL-FUEL TASK FORCE REPORT AND AMENDMENTS (Jean-François Renaudin) (Documents that are finalized will be on the UN website; discussion documents are sent only to the principals participating in the meetings.)

31. New meetings of HDDF TF are now scheduled in Brussels (Brey Building) for 10 October (plenary + calculation formulae); 14 November (plenary + natural gas specific);14 December; SEE OTHER MEETINGS.
32. Two new annexes are being created: in R.49 rev 6 (Euro VI); and Annex 11 in R.49 rev 5 (Euro V and EEV)
33. Three types of systems have been defined, each with two subcategories A and B. These are based on the gas energy ratio (GER) specific to the engines. (But for Type 3 there is only one type, B., with a system running less than 10% on natural gas).
34. Engine markings were defined: for CNG use (as now) H,L,HL (designating for 'high' or 'low' btu methane; for LNG, 'M' (methane); and for LPG use 'Q'.
35. Engine family concept discussed for compression ignition systems. In case of LPG engines a HDDF Type 2B might be allowed to be included into a type 3B family provided it complies with the Type 3B requirements
36. Installation requirements would have to be satisfied to be approved.
37. Miscellaneous items: NTE lab test must be performed; Durability specifically noted to HDDF; CO2 and FC will have to be reported in both modes; At this stage Annex 15 will not be applicable to small vehicles. Annex 15 will become applicable to those vehicles only when R101 considers D-F engines.
38. Proposal for GFV decision: Non HDDF specific items have been identified, such as: ETC/WHTC correlation for HC for NG engines, for which data is needed; PN_{whtc} (PI) Commercial Vehicle Data (CVD) requested; LNG 'blow off' and the green house gas effects; and introduction of LNG into R49 (single fuel type-approval).
39. Two options for GFV decision: Items in line 38 (above) can be dealt with in a new dedicated task force or the HDDF-TF could deal with these issues in meetings dedicated to addressing these issues. Mr. Renaudin suggested that the HDDF-TF can dedicate specific time to address the miscellaneous issues with the appropriate expertise to provide answers and/or solutions.
40. There was a discussion about LNG 'blow-off' and its effects on both safety and the environmental impact of releasing methane into the atmosphere. The group finally agreed that the various technical solutions will have to be dealt with very specifically for both safety and environmental aspects. Relatively strict limits and a regulatory approach ultimately will have to be brought back to the contracting parties at some point that address these concerns in regulatory language. This will have to be based on quantifiable evidence about 'blow-off' (time; methane quantities released; etc.) The two co-secretariats of the LNG Task Force (Mr. Del Alamo and Mr. Seisler) will bring the concerns back to the chairman and members of the LNG Task Force.
41. This concern will be dealt with on 14th November in the afternoon.

IX. Regulations 115 & 83: New bi-fuel vehicle definitions and related provisions for Type test 1 (AEGPL)

42. AEGPL points out the modifications made to the doc GFV-15-02 with respect of doc GFV-14-02, in line with the two comments received in the previous meeting of the group:
    a. Insertion of 80% energy minimum limit for LPG use in the definition of "bi-fuel type B vehicle" (see point 49 of the minutes GFV-14-06)
    b. Simultaneous extension of both proposals (R 115 and R83) to CNG (see point 53 of the minutes GFV-14-06)

43. NGVAE raises the issue of how to measure the actual gas consumption of such a system. In this definition, if the vehicle runs on less than 80% then the vehicle could not be homologated. In discussion, it is determined that the regulatory language can include flexibility in the methods of measuring the fuel consumption under this vehicle definition.
44. NGVAE raises a concern about the definition of a Bi-Fuel Type B being confused with a dual-fuel. NGV Global indicates that they share this same concern.
45. AEGPL highlights that dual-fuel definitions, as finally proposed, regard only diesel-gas vehicles, while the definitions under discussion relate only to petrol-gas cases, thus remaining in the topic of positive-ignition engines (same driving cycle, same emission limits,etc.);
46. TNO makes several comments and proposals:
    a. Definitions: rephrase the bi-fuel general definition in order to re-include bi-fuel Type A and B in the same "category" of vehicles;
    b. Minimum limit of gas use: convert it into a maximum limit of petrol use, and motivate the value of 80% that seems too low:
    c. Energy ratio calculation:
        i. gas mass measurement: provide a suitable alternative method to static weighing of gas container - such as mass flow metering - ensuring the same accuracy;
        ii. gas ratio calculation: provide more details on formula because it appearsas a mass ratio rather than an energy ratio
47. In response to TNO comments, AEGPL observes:
    a. Definitions: a common definition of bi-fuel vehicle is agreeable and even better;
    b. Minimum limit of gas use: the choice of a gas limit instead of a petrol limit was due to the fact that petrol consumption is very low and, furthermore, it would be difficult to be measured with simple instruments, in a bench test; data will be collected to promote the value of 80%;
    c. Energy ratio calculation:
        i. Gas mass measurement: allowing a possible alternative method with the same accuracy is agreeable; with particular reference to mass flow metering, AEGPL points out that the reliability of such type of instrument – on gas - seems not proven yet in transient conditions and, furthermore, its positioning and installation, in a bench test, might raise some problems, likely affecting reproducibility of the measurement method;
        ii. Gas ratio calculation: it is an energy ratio where the heating value of gas has been deleted at the numerator and denominator; in fact, FC is conservatively determined considering the cycle is driven exclusively on gas;
48. There is an extended discussion about the definitions now specifying a Type A and Type B bi-fuel; the test procedures;; the possible combination of the current provision allowing only 60 seconds running on petrol and the new one setting an energy percentage limit;
49. Consensus: AEGPL will come with a new proposal taking into account the following:
    a. Definition of bi-fuel vehicles will be revised in accordance with TNO proposal;
    b. Minimum limit for gas use: data supporting 80% value will be collected and provided to the group;
    c. Energy ratio calculation:
        i. Gas mass measurement: a safeguard clause allowing different but equivalent methods will be added;
        ii. Gas ratio calculation: a detailed demonstration of the formula will be circulated to the group; an analytical explanation of the conservative

approach of the formula when using FC calculated on gas only will be sent to the group;

d. Petrol use in gas mode: a proposal aimed at combining the current time-based limit and the new energy-based cap will be submitted to the group;

50. There is a request (in abstentia) from Mr. Radzimirski about provisions in the scope of the regulation that must be considered, but this will be brought up again in a future meeting.

X. Definitions in Regulation 67 at the GRSG (AEGPL, Mr. Piccolo)

51. After a long discussion, the group agrees to propose the following modifications:

a. Elimination of definitions 2.20 and 2.21 and of provision of par. 17.11.6

b. Amendment of paragraph 17.11.5 to read "Vehicles with more than one fuel system shall have a fuel selection system ".

52. In order to accelerate the approval of such modifications, the group decides also to convey the proposal as a corrigendum to the relevant WP29 document (ECE/TRANS/WP.29/2011/108) that is on the agenda of the next TCMV meeting (23rd meeting of 13 October 2011) .

53. **Other items**

54. Ms. Leifheit (VW) asks to what degree hydrogen from surplus electrolysis can be used in the natural gas network and then stored (as hydrogen)? She wants to know this in order to help VW determine in their current designs of NGVs and whether they have to consider a hydrogen component in the fuel. Discussion in the group indicates that research by the Commission (NaturalHy project) concluded that no more than 30% H in the natural gas network is safe. R.110 prohibits more than 2% hydrogen in natural gas (specifically for use with steel cylinders). And, although there are four fuel stations in Italy supplying a combination of hydrogen and methane (mixed at the station) there generally is not a current trend in the industry to blend hydrogen and methane/natural gas in the pipeline network. Therefore, VW should not be concerned about this potential when it is designing its new NGVs. TNO also will provide assistance to AEGPL to clarify and input into the regulation.

XI. Next meeting(s)

55. The next GFV meeting is set for15 December, following the HDDF-TF meeting on 14th December. The Commission will arrange suitable rooms be available to the groups.

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Participants

André Rijnders (Chairman, RDW-NL)
Henk Dekker (TNO)
Jean-François Renaudin (Volvo)
Jeffrey Seisler (NGV Global)
Jaime Del Alamo (NGVA Europe)
Salvatore Piccolo (Federchimica - AEGPL)
Alex Stoehr (German LPG Association - AEGPL)
Alberto Castagnini (AEB Technology)
John Crawford (Westport)
Francesco Cagnolati (Landi Renzo)

John May (AECC)
Bernardo Martinez (DG Enterprise)
Petter Asman (DG Enterprise)
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Susanne Leifheit (VW)