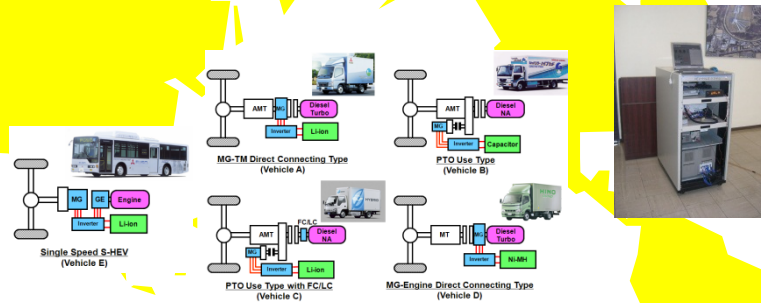
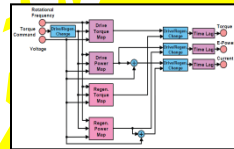




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agenda item 4(a))



# GRPE Informal Working Group on Heavy Duty Hybrids

Report to GRPE 66  
Geneva, 06 June 2013



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# Summary of 13th HDH Meeting

- **The results of the 13th meeting in Borlänge on 21 and 22 March 2013 are summarized, as follows:**
- **The basic vehicle cycle will be the WHVC with road gradients; 2 methods for calculating the road gradients will be investigated**
  - **The institutes propose that the model structure allows for using OEM specific models**
  - **The institutes will communicate the deliverables of validation test program 1 and the related time schedule within the next two weeks**
  - **The new model structure will be available by the end of April**
  - **The VECTO transmission model by TU Graz will be added to the open source model**
  - **Master ECU needs to be defined, supportive ECUs via interface or software emulation**
  - **Validation test program 2 will start in May with Volvo parallel hybrid bus, followed by Iveco parallel hybrid MD truck and MAN serial hybrid bus**
    - ❖ **Chassis dyno tests and road tests (w/o emissions measurement) will be run at JRC, engine dyno tests at OEM**
    - ❖ **Command signal frequency for engine tests will be 1 Hz, 10 Hz, 50 Hz**
  - **OICA and EPA will discuss bilaterally the possibility of HILS testing at EPA and report at the 14<sup>th</sup> HDH meeting**
  - **Model verification will be investigated during validation test program 2 including powertrain verification**
  - **The hybrid test procedure will be developed as an amendment to gtr n° 4 (new Annex 8), and will include HILS and powertrain testing**



# Summary of 14th HDH Meeting

- **The results of the 14th meeting in Geneva on 04 June 2013 are summarized, as follows:**
- **The results of validation test program 1 with the new model structure were presented by the institutes; the new model structure includes a comprehensive component model library, a new signal naming convention and restructured vehicle models**
  - **The models will be further developed based on feedback from stakeholders**
  - **The drive cycle investigations resulted in different road gradients from the two calculation methods; application of road gradients to WHVC needs further investigation during validation test program 2 incl. the use of road gradients fixed in the gtr**
  - **Validation test program 2 at JRC has started in May; the details of the test program were defined between JRC and the participating OEMs**
  - **OICA confirmed that individual members will arrange for HILS testing at EPA and will start discussions with EPA on the most suitable approach**
  - **OICA informed that they will provide budget for model verification by the institutes during validation test program 2**
  - **EPA requested to include powertrain testing and verification in the gtr, and to validate the HILS method with emission results, and confirmed to take part in validation test program 2**
  - **The proposal by Chair and Secretary of using the HILS CO<sub>2</sub> result as input to regional CO<sub>2</sub> regulations was agreed**
  - **The HDH drafting group has been established and had two meetings, so far; the Technical Secretary has not yet been appointed, but it is hoped that the budget will be available in June**



# Status of Validation Test Programs

## ➤ Validation test program 1 largely completed

- Japanese open source model has been re-structured for greater flexibility
- New component library and signal naming convention has been developed
- Serial hybrid and parallel hybrid models are available for stakeholder testing
- Positive feedback on the new models from OEMs
- Next model release planned by end of June 2013,

## ➤ Validation test program 2

- Validation test program 2 with real HVs is underway with first vehicle testing (Volvo parallel hybrid bus) completed
- Data evaluation will be completed by mid-September 2013
- OICA will cover budget for contributions of institutes (approx. 200 k€) incl. further investigations on drive cycle modifications (road gradients)
- Individual OICA members are contacting EPA on how to best conduct HILS<sub>5</sub> testing at EPA



# Topics for HDH Work Program

- **Assessment of chassis dyno and powerpack testing**
  - Further input from Contracting Parties for consideration in the final report is required by October 2013
  
- **Drafting of the gtr**
  - Drafting group established, but Technical Secretary not yet available
  - New Annex 8 to gtr n° 4 will include HILS method based on JP regulation Kokujikan 281 modified by input from HDH work program, and powertrain method based on US-EPA procedure
  - Informal document is intended to be submitted to GRPE 68 in January 2014
    - ❖ This timing is in jeopardy, if nomination of Technical Secretary is further delayed
  
- **Other topics**
  - OICA suggest to include plug-in hybrids and will develop a proposal in due time for discussion at the 15<sup>th</sup> HDH meeting
  - GRPE is asked to confirm HDH IWG agreement on CO<sub>2</sub> emissions (see page 7)



# CO<sub>2</sub> Emission

## ➤ Background

- CO<sub>2</sub> emission is part of the HDH mandate
- Currently, CPs have their own regional HD CO<sub>2</sub> regulations in place or are developing CO<sub>2</sub> regulations for HD vehicles
- There is no WP.29 mandate for a CO<sub>2</sub> regulation for conventional heavy duty vehicles

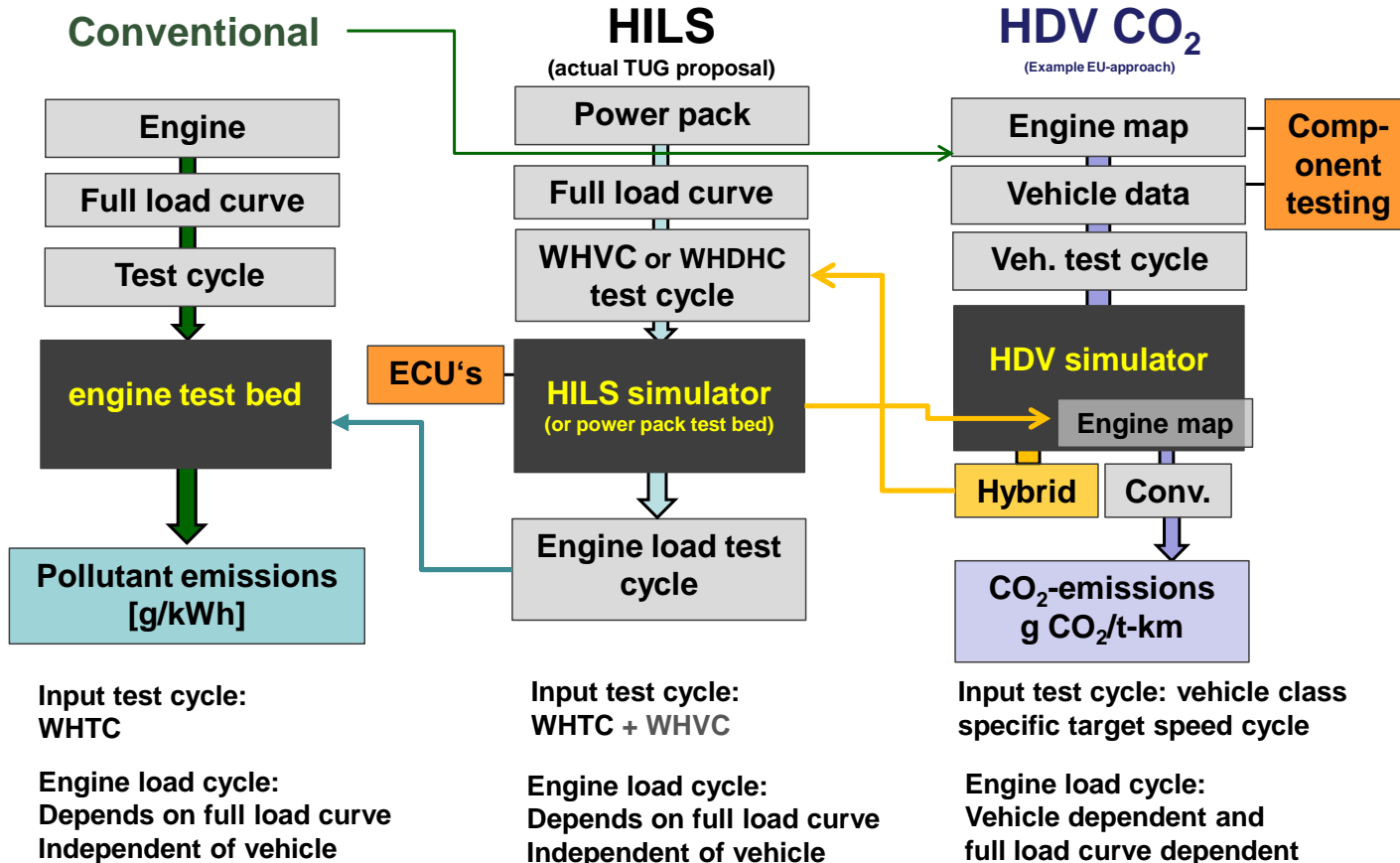
## ➤ Conclusions from meeting with DG-CLIMA of EU-COM

- It is not appropriate to develop a CO<sub>2</sub> regulation by UNECE just for HD hybrid vehicles
- HDH IWG should develop the procedure for CO<sub>2</sub> determination, thereby fulfilling their mandate on CO<sub>2</sub> emissions
- The HILS CO<sub>2</sub> result may then be used as input for the regional CO<sub>2</sub> regulations, if needed
- For the EU, a possible approach is shown on page 8
- Chair and Secretary suggest other CPs to apply a similar approach



# EU Approach on CO<sub>2</sub> Emission

## Option for harmonisation of test procedures







# Roadmap & Project Planning

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Activity	2 0 1 1				2 0 1 2				2 0 1 3				2 0 1 4																		
	06	07	08	09	10	11	12	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03	04	05	06	07	08	09	10	11	12
HILS model verification	[Purple bar]				[Purple bar]																										
Component testing verification	[Purple bar]				[Purple bar]																										
Extension to non-electric hybrids	[Purple bar]				[Purple bar]																										
PTO operation	[Purple bar]				[Purple bar]																										
WHVC weighting & scaling factors	[Purple bar]				[Purple bar]																										
Assessment of chassis dyno procedure	[Yellow bar]				[Yellow bar]																										
Assessment of powerpack testing	[Yellow bar]				[Yellow bar]																										
7th meeting				X																											
8th meeting					X																										
9th meeting						X																									
Interim report										[Checkered]																					
Validation test program 1																															
10th meeting										X																					
11th meeting											X																				
Validation test program 2																															
Drafting text for gtr n°4																															
12th meeting												X																			
Evaluation & conclusions																															
13th meeting													X																		
Final report																															
14th meeting														X																	
15th meeting																															
16th meeting																								X							
GRPE adoption (17th meeting)																										X					
WP.29 adoption																															X

➔ Final report and informal document of gtr: 68th GRPE session (January 2014)

➔ Official document and GRPE adoption: 69th GRPE session (June 2014)

➔ WP.29 adoption at 164th WP.29 (11/2014)



# Next Meetings

- **The next HDH meetings are scheduled as follows:**
  - **The 15th meeting will be on 24 and 25 October 2013 in San Francisco**
  - **The 16th meeting will be on 08 January 2014 in Geneva (to be confirmed)**
  - **The 17th HDH meeting will be in March 2014 in Europe (date and place to be confirmed)**
  
- **GRPE is asked to**
  - **Reserve a half day for the 16th HDH meeting during the 68th GRPE session in January 2014**