

STATUS OF THE GRPE INFORMAL GROUP ON HEAVY DUTY HYBRIDS (HDH)

The Informal Group on Heavy Duty Hybrids (HDH) held two meetings since the 63rd GRPE session. The 9th meeting took place from 21 to 23 March 2012 in Tokyo and focused on the status of the research program and technical discussion about hybrid emission and CO₂ testing methods, and included a HILS demonstration by JARI. The 10th meeting took place on 05 June 2012 in Geneva and was dedicated to the final presentations from TU Graz and Chalmers University and the decision on validation step 1.

EU-COM presented the status quo on reducing CO₂ emissions from heavy duty vehicles in the European Union. The work program was launched following a political commitment to reduce CO₂ emissions by 80-95% below 1990 levels by 2050. In Lot 1 of the work program, a HDV market survey in the EU was conducted. Lot 2 defined the principal measurement procedure. The approaches explored so far are measurement on chassis dynamometer, measurement with PEMS and model simulation. The preferred option is component testing and model simulation with post-verification via measurement. The HDV CO₂ emissions strategy is tentatively planned to be adopted by the Commission by the first half of 2013.

ICCT presented an overview of certification procedures for advanced technology HDVs with special emphasis of evaluating test methods and opportunities for global alignment. The ICCT (International Council on Clean Transportation) has offices in the USA, Europe and China, and its mission is to improve the environmental performance and efficiency of onroad vehicles, aircraft, and marine vessels. The GTR No. 4 test procedure is considered as a potential first step towards harmonization of both criteria pollutant and GHG programs worldwide after 2020. The ICCT considers the GRPE/HDH process as important for creating a stronger link between criteria pollutant and FE/GHG regulations.

TU Vienna summarized the results of their work package and presented a proposal for validation step 1. Validation step 1 is intended to verify the suggested changes of the research institutes to the Japanese HILS method, and is based on the ECU as software in the loop. The validation would start with a serial hybrid. The participants principally agreed to the proposal. It was common understanding that starting with the serial hybrid would be most beneficial.

TU Graz gave an overview of the different options for the determination of the HILS engine cycle. Option A corresponds to the Japanese method by using the vehicle cycle WHVC and generic vehicle data as input signals. Option B1 uses system power and engine rpm at the wheel hub as input signals while option B2 uses system power and engine rpm at the shaft as input signals. Both options are based on the engine cycle WHTC resulting in the World Heavy Duty Hybrid Cycle (WHDHC). The evaluation of WHVC weighting factors is currently limited to city buses. The results with the other vehicle classes and cycles will be delivered to the HDH group, once vehicle classes and test cycles within the EU CO₂ program will have been defined. PTO load should not be added for brake specific criteria pollutant emissions, since influence is low, but may be included in the CO₂ test procedures.

Chalmers confirmed that non-electric hybrid powertrain topologies fit well into the same categories as for electric hybrid powertrains. In general, non-electric hybrids can be divided into serial, parallel and split powertrain topologies. The most promising concepts are CVT and flywheel, motor/generator and flywheel and hydraulic (or pneumatic) pump/motor and accumulator. No major modifications to the HILS method are needed for non-electric hybrids. MATLAB/Simulink implementation, standardization of variable names and system modeling for a parallel hydraulic hybrid were developed.

Japan proposed an alternative to the WHVC approach, which consists of applying a torque reduction factor to the WHTC. In sections of the WHTC where the electric motor does not work, the original WHTC would be used. In sections where electric motor works, a torque reduction rate would be applied to the WHTC, which is based on the ratio between engine work and total system work over the WHVC.

EMA gave an overview of the powerpack test procedures within the EPA GHG rule. TÜV Nord reported about their experience with chassis dyno testing in the context of the EU CO₂ work program.

TU Vienna submitted a proposal and quote for validation step 1, which will be done jointly by TU Vienna, TU Graz and Chalmers University, and consists of three tasks

- Task 1: serial hybrid simulation budget 181,570 €
- Task 2: parallel hybrid simulation budget 89,170 €
- Task 3: report, interface & user manual budget 44,960 €

ACEA agreed to submit the budget for task 1. EU-COM will check availability of budget, other participants are asked to consider a contribution. Since validation step 2 with real hybrid vehicles should only start after validation step 1, or with a short overlap, a 6 months extension of the HDH mandate until mid 2014 is requested. The updated road map, as agreed by the HDH informal group, is shown on page 9 of informal document n° GRPE-64-14.

Next steps:

- Validation step 1 based on SILS (Software-in-the-loop simulation) will start in June 2012
- Validation step 2 with real HD Hybrid Vehicles will start around March 2013
- Discussion on chassis dyno and powerpack testing will continue on the basis of input from ongoing programs at the Contracting Parties, with input required by end 2012

The ICCT extended an invitation to the group to meet in San Francisco in 2013. Sweden is considering hosting the 11th meeting in spring 2013. Consequently, the next meetings are scheduled as follows:

- 11th meeting: 10 to 12 October 2012, Ottawa
- 12th meeting: 15 January 2013, Geneva (date to be confirmed)
- 13th meeting: March 2013 (date and place to be confirmed)
- 14th meeting: June 2013, Geneva (date to be confirmed)
- 15th meeting: October 2013, San Francisco (date to be confirmed)

GRPE is asked to reserve a half day for the 12th HDH meeting during the 65th GRPE session.
