GRPE Informal Group on Heavy Duty Hybrids

Secretary’s Report to GRPE 61, Geneva, 13 January 2011
Contents

- HILS and WHDC
- Conclusions from 3rd HDH meeting
- Framework of hybrid emissions certification
- Roadmap & project planning
- Report from 4th HDH meeting
Development of WHDC Engine cycles

**STEP 1**
- **Task 1**: Classification of most important parameters
- **Task 2**: Collection of Statistics on HD vehicle use
- **Task 3**: Collection and analysis of In use driving data
- **Task 4**: Reference database (combination of in use data with appropriate weightings for each cell of the classification matrix)

**STEP 2**
- **Task 5**: Transient vehicle cycle \( V(t), P/Pn(t) \) (Combination of database modules, Chi square statistics)

**STEP 3**
- **Task 6**: Transformation of vehicle cycle \( V(t), P/Pn(t) \) into engine cycle \( n(t), \text{MMmax}(t) \) for a wide range of engines (Drivetrain model)

**STEP 4**
- **Task 7**: Reference transient engine cycle (Approximation and regression analysis)
- **Task 8**: Reference steady state cycle
- **Task 9**: Evaluation and Conclusion

The development of representative engine test cycle
Relation between HILS and WHDC

✔ Development of WHTC (universal engine cycle)
  - Tasks 1 to 5 resulted in the universal WHDC vehicle cycle (WHVC), which is the basis for the engine cycles WHTC and WHSC
  - Under task 6, the WHVC was transformed into an engine cycle on the basis of a standardized drivetrain and vehicle model
  - Under task 7, the resulting engine cycle was finalized into the reference transient cycle WHTC by regression analysis

✔ Development of HILS/WHDC (individual engine cycle)
  - WHDC tasks 6 and 7 are replaced by HILS on the basis of an individual (hybrid) drivetrain and vehicle model
  - As a result, individual engine reference cycles will be established
  - Since only the engine is tested, the test cell and data evaluation procedures of gtr n°4 can be applied w/o major modifications
  - A new annex on the HILS procedure would need to be added to the gtr
The conclusions were summarized by the Chair as follows:

- The terms of reference and proposal (GRPE/60/11 and GRPE/60/12) were confirmed
- The first step is to investigate the HILS approach and develop the methodology
- The methodology should make sure that no “back sliding” of emissions compared to conventional vehicles can occur
- It is crucial that the procedures are robust and transparent enough for a regulation that may be used by different contracting parties and approval authorities with consistent results
- Keeping the uncertainties in mind the group should be open to investigate other possibilities such as powerpack testing even though this is not included in the current mandate
- Feasibility of chassis dyno testing should be done and reported to GRPE. Some investigations can possibly be done in parallel
As a result of these conclusions, hybrid emissions certification must:

- cover a wide range of RESS (battery, capacitor, hydraulic accumulator, kinetic storage device, flywheel capacitor, fuel cell)
- account for RESS and engine power
- allow for technology development
- include provisions for transmission, gearing and rear axle ratio
- account for benefits of hybrid PTO operation
- account for vehicle regenerative energy gained or lost during testing
- minimize discrepancy between certification and real world CO2 and criteria emissions
# Roadmap & Project Planning

## Task Overview

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The results of the 4th meeting are as follows:

- Amendment to gtr 4 as first option, as proposed by the Chairman, has been agreed; development of a separate gtr will be re-assessed and the conclusions reported back to GRPE at a later stage.
- Roadmap and project planning as presented by the Secretary have been agreed with minor modifications.
- The open source model provided by Japan will be evaluated.
- 4 research institutes expressed interest in conducting the work program, and will be asked for quotes.
- OICA will provide 200 t€ budget, COM contribution is pending.
- The next meeting will be from 16 to 18 March at EPA, Ann Arbor.

GRPE is asked to:

- Approve the roadmap and project planning.
- Approve extension of the mandate to powerpack testing.
- Reserve a half day HDH meeting at the 62nd GRPE in June 2011.