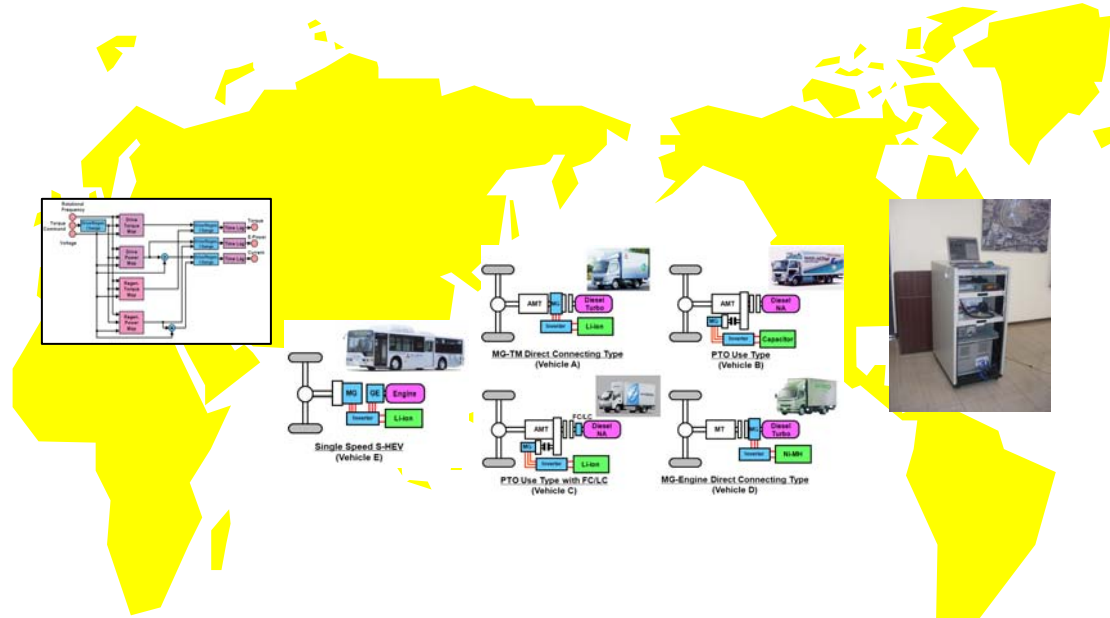




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Working Paper No. **HDH-09-10**
(9th HDH meeting, 21 to 23 March 2012)



GRPE Informal Group on Heavy Duty Hybrids

9th HDH, Tokyo, 21 to 23 March 2012



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Task List for HDH Research Program

- **To accommodate with its mandate, HDH has launched a research program on the major elements of the HILS method. The research program covers the following five tasks:**
 - **Task 1: Investigation and modification, if applicable, of the Japanese HILS model and interface including a proposal for a verification method w/o vehicle testing**
 - **Task 2: Investigation and modification, if applicable, of the HILS component testing**
 - **Task 3: Extension of HILS to non-electrical hybrids, which are currently not covered by the Japanese test procedure**
 - **Task 4: Inclusion of PTO operation, which normally takes place outside the test cycle**
 - **Task 5: Development of WHVC weighting/scaling factors to represent real world vehicle operation**



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Status of HDH Work Program

➤ Research program

- At the 6th HDH meeting, the following project plan was adopted
 - TU Vienna will cover tasks 1 and 2; budget by OICA
 - TU Graz will cover tasks 4 and 5; budget by EU COM
 - Chalmers will cover task 3 and contribute to tasks 1, 4 and 5; budget shared between OICA, Sweden and Swedish Energy Agency (SEA)
 - TNO will assist EU-COM in managing the program
 - Total budget is 265 k€

➤ HDH Status

- Work program at TU Vienna has been finished
- Work program at TU Graz and Chalmers is about 2 to 3 months behind schedule
- Discussion on chassis dyno and powerpack testing will continue on the basis of input from ongoing programs at the Contracting Parties



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Report from 8th HDH Meeting

➤ Results of the 8th meeting, Geneva, 17/01/12:

- **TU Vienna presentation**
 - Japanese HILS certification method is a possible concept and provides a good basis in order to do certification of heavy duty hybrids
 - Interface and powertrain model have to be modified in case of additional signals
 - If simulation results are not accurate enough, model depth has to be enhanced
 - In case of complex simulation (e.g. IC), an extended HILS-Method may be used
 - As a first validation, it is suggested to simulate a real heavy duty hybrid vehicle and software modelled ECU by using the Japanese open source model
- **TU Graz presentation**
 - Wheel power cycle (WHDHC) as an alternative to the vehicle cycle WHVC seems to work properly for hybrids
 - WHVC weighting factors can be calculated from HDV-CO2 test cycles or from any other representative cycles
 - PTO loads not suggested for criteria pollutants, but may be included for CO2
- **Chalmers presentation**
 - Non-electric hybrid powertrain topologies fit well into the same categories as for electric hybrid powertrains
 - Mathematical models for flywheel, accumulator, pump/motor and CVT have similar model structures as in the Japanese regulation



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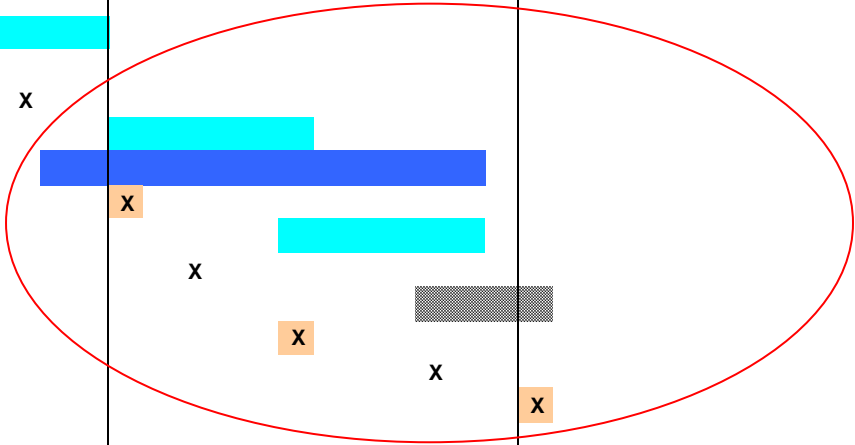
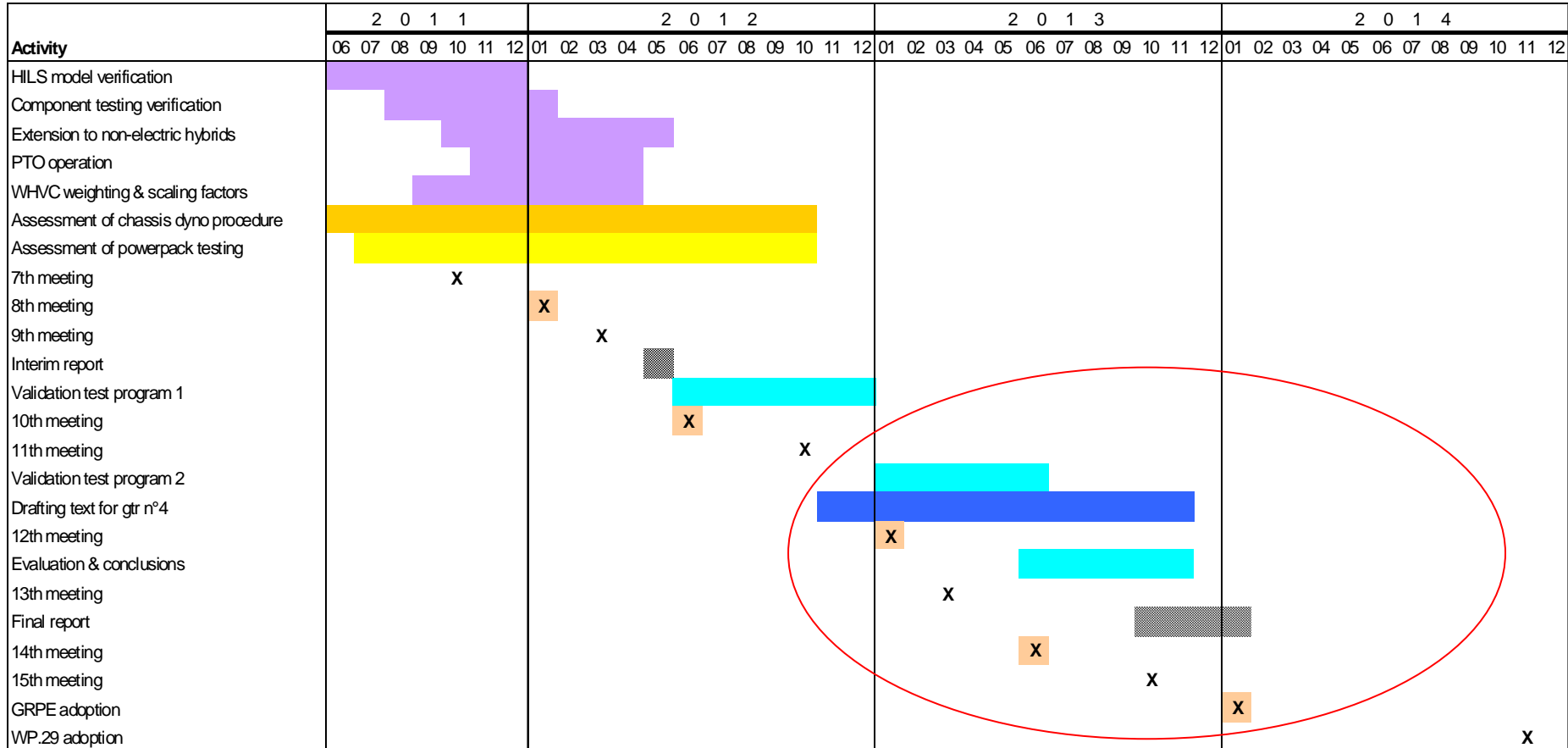
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Major Items for 9th Meeting

- **The following items need to be discussed and decided:**
 - **Simulation of a real heavy duty hybrid vehicle and a software modelled ECU by using the Japanese open source model as first validation study**
 - ➔ will need to be finished before 2nd validation starts
 - ➔ will consequently delay roadmap
 - **Discussion of possible alternatives, such as extended HILS-testing method, powerpack testing or chassis dyno testing**
 - **Acceptance of considering the wheel power cycle (WHDHC) as an alternative to the vehicle cycle in the first validation study**
 - ➔ requires a method to define and to normalize the full load curve for hybrid power packs
 - **Determination of vehicle category for PTO simulation**
 - **Overall validation scheme**
 - **Laboratories/institutes for validation studies**
 - **Updated roadmap and project planning**



Updated Roadmap & Project Planning



- ➔ Timing for GRPE adoption delayed until 01/2014
- ➔ Timing for WP.29 adoption likely to be delayed by 8 months (11/2014)
- Updated roadmap agreed by HDH informal group at 9th meeting



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Next Meetings

- **The next meetings are scheduled as follows:**
 - **The 10th meeting will be on 05 June 2012 in Geneva**
 - **The 11th meeting will be from 10 to 12 October 2012 in Ottawa (date to be finally confirmed by EC)**
 - **The 12th meeting will be on 15 January 2013 in Geneva (to be confirmed)**
 - **The 13th meeting will be in March 2013 (date and place to be confirmed)**